STIC Search Report
EIC 1700

STIC Database Tracking Number: 215759

TO: Vickey Ronesi Location: REM 10D24 Art Unit : 1714 February 22, 2007 Case Serial Number: 10/649877	From: Mei Huang Location: EIC 1700 REMSEN 4B28 Phone: 571/272-3952 Mei.huang@uspto.gov

Search Notes

Examiner Ronesi,

Please feel free to contact me if you have any questions or if you would like to refine the search query,

Thank you for using STIC services!

Mei Huang

215759

Banks, Kendra

From: VICKEY RONESI [vickey.ronesi@uspto.gov]
Sent: Friday, February 16, 2007 9:16 AM
To: STIC-EIC1700
Subject: Database Search Request, Serial Number: 10/649877

Requester:
VICKEY RONESI (P/1714)
Art Unit:
GROUP ART UNIT 1714
Employee Number:
80299
Office Location:
REM 10D24
Phone Number:
(571)272-2701
Mailbox Number:

Case serial number:
10/649877
Class / Subclass(es):
524/495
Earliest Priority Filing Date:

Format preferred for results:
Paper
Search Topic Information:
Please search for independnet claim 5. In particular, modifying a carbon nanotube with a basic or acidic functional group and dispersing in a solvent having an opposite polarity.
Special Instructions and Other Comments:

```
=> fil reg
FILE 'REGISTRY' ENTERED AT 17:07:51 ON 21 FEB 2007
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=> d his nofile

     (FILE 'HOME' ENTERED AT 14:17:24 ON 21 FEB 2007)

     FILE 'HCAPLUS' ENTERED AT 14:17:33 ON 21 FEB 2007
L1             1 SEA US2004136894/PN

     FILE 'REGISTRY' ENTERED AT 14:18:50 ON 21 FEB 2007
L2             5 SEA (110-86-1/BI OR 26298-81-7/BI OR 26615-45-2/BI OR
                 7440-44-0/BI OR 7697-37-2/BI)
L3             1 SEA 7440-44-0/RN

     FILE 'HCAPLUS' ENTERED AT 14:41:58 ON 21 FEB 2007
L4         38848 SEA NANOTUB? OR NANO(A)TUB?
L5        185995 SEA NANOCRYST? OR NANOPARTICL? OR NANOPARTICULAT? OR
                 NANOSTRUCTURE? OR NANOCHEM? OR NANOSIZ? OR NANOSCAL? OR
                 NANOMATERIAL? OR NANOCOMPOSIT?
L6         21070 SEA NANO(A)(CRYST? OR PARTICL? OR PARTICULAT? OR
                 STRUCTURE? OR CHEM? OR SIZ? OR SCAL? OR MATERIAL? OR
                 COMPOSIT?)
L7        338665 SEA L3
L8         23277 SEA L3(L)(L4 OR L5 OR L6)
L9         39683 SEA (CARBON OR C)(3A)(L4 OR L5 OR L6)
L10              QUE MODIF?
L11              QUE FUNCTION?
L12        27335 SEA L7 AND (L4 OR L5 OR L6)
L13         3729 SEA (L12 OR L9) AND L10
L14         6397 SEA (L12 OR L9) AND L11
L15          902 SEA L13 AND L14
L16         1345 SEA L10(3A)L9
L17          317 SEA L16 AND L15
L18              QUE DISPERS?
L19              QUE SUSPEN? OR COLLOID? OR EMULS? OR MICROEMULS? OR
                 SLURR?
L20           78 SEA L17 AND (L18 OR L19)
L21              QUE SOLVENT?
L22           21 SEA L20 AND L21
L23              QUE POLAR?
L24              QUE (BASE# OR BASIC? OR ACID##)(3A)GROUP#
L25            9 SEA L20 AND (L23 OR L24)
L26            6 SEA L22 AND L25
L27              QUE POLYM? OR COPOLYM? OR HOMOPOLYM? OR RESIN?
L28           46 SEA L20 AND L27

     FILE 'REGISTRY' ENTERED AT 16:17:55 ON 21 FEB 2007
L29            1 SEA 7697-37-2/RN
L30            1 SEA "SULFURIC ACID"/CN
L31            1 SEA "PHOSPHORIC ACID"/CN
L32            1 SEA 110-86-1/RN
L33            1 SEA TRIMETHYLAMINE/CN
L34            1 SEA TRIETHYLAMINE/CN
L35            1 SEA TRIPROPYLAMINE/CN
L36            1 SEA DBU/CN
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specific acids

common polar solvents

02/22/2007

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     FILE 'HCAPLUS' ENTERED AT 16:33:30 ON 21 FEB 2007
L37       175392 SEA L29 OR HNO3 OR NITRIC(W)ACID#
L38       431162 SEA L30 OR H2SO4 OR SULFURIC(W)ACID#
L39       148694 SEA L31 OR H3PO4 OR PHOSPHORIC(W)ACID#
L40       223260 SEA L32 OR PYRIDINE#
L41        18496 SEA L33 OR TRIMETHYLAMINE# OR NME3
L42        39137 SEA L34 OR TRIETHYLAMINE#
L43         2502 SEA L35 OR TRIPROPYLAMINE#
L44         3223 SEA L36
L45              QUE DBU
L46              QUE (TRIMETHYL OR TRIETHYL OR TRIPROPYL)(A)AMINE# OR
                 ME3N OR NET3 OR ET3N
L47              QUE SULFONIC(A)ACID#
L48         1494 SEA (L12 OR L9) AND (L37 OR NITRATED OR NITRATING OR L38
                 OR SULFATED OR SULFATING OR L39 OR PHOSPHORATED OR
                 PHOSPHORATING OR SULFONATING# OR L47)
L49          226 SEA (L12 OR L9) AND ((L40 OR L41 OR L42 OR L43 OR L44 OR
                 L45) OR L46)
L50           36 SEA L48 AND L49
L51           23 SEA L50 AND L27
L52           13 SEA L50 AND (L18 OR L19)
L53            5 SEA (L51 OR L52) AND L16
L54            9 SEA L51 AND L52
L55            2 SEA L53 AND L54
L56            7 SEA L55 OR L26
L57           17 SEA (L25 OR L52 OR L53 OR L54) NOT L56
L58           25 SEA (L22 OR L51) NOT (L56 OR L57)


=> fil hcap
FILE 'HCAPLUS' ENTERED AT 17:07:54 ON 21 FEB 2007
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=> d l56 ibib abs hitstr hitind 1-7

L56  ANSWER 1 OF 7  HCAPLUS  COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER:         2006:1001357  HCAPLUS
DOCUMENT NUMBER:          146:8911
TITLE:                    Fabrication and characterization of multi-walled
                          carbon nanotubes/polymer blend
                          membranes
AUTHOR(S):                Choi, Jae-Hyun; Jegal, Jonggeon; Kim, Woo-Nyon
CORPORATE SOURCE:         Membrane and Separation Research Center, Korea
                          Research Institute of Chemical Technology,
                          Yuseong, Daejeon, 305-606, S. Korea
SOURCE:                   Journal of Membrane Science (2006), 284(1+2),
                          406-415
                          CODEN: JMESDO; ISSN: 0376-7388
PUBLISHER:                Elsevier B.V.
DOCUMENT TYPE:            Journal
LANGUAGE:                 English
AB   Multi-walled carbon nanotubes
     (MWNTs)/polysulfone (PSf) blend membranes were prepared by a phase
```

inversion process, using N-methyl-2-pyrrolidinone (NMP) as a **solvent** and water as a coagulant. Before making the blend membranes, MWNTs were first treated with strong acid to make them well **dispersed** in organic **solvents** such as NMP for the preparation of homogeneous MWNTs/PSf blend solns. The prepared MWNTs/PSf blend membranes were then characterized using the several anal. methods such as a Fourier transform IR spectroscopy, a contact angle goniometer, a SEM and permeation tests. Because of the hydrophilic MWNTs, the surface of the MWNTs/PSf blend membranes appeared to be more hydrophilic than a just PSf membrane. The carboxylic **acid functional groups** developed by the treatment with acid on the surface of MWNTs seemed to act to increase hydrophilicity of the blend membranes. The morphol. and permeation properties of the blend membranes were also found to be dependent on the amts. of MWNTs used. The pore size of the blend membranes increased along with the contents of MWNTs up to 1.5%, then decreased, and at 4.0% of MWNTs, it became even smaller than PSf membrane. The PSf membrane with 4.0% of MWNTs showed higher flux and rejection than the PSf membrane without MWNTs.

IT **7440-44-0D**, Carbon, surface-**modified** with concentrated acids
RL: MOA (Modifier or additive use); USES (Uses)
(**nanotubes**; multi-walled **carbon nanotubes**/polymer blend membranes)
RN 7440-44-0 HCAPLUS
CN Carbon (CA INDEX NAME)

C

CC 38-3 (Plastics Fabrication and Uses)
Section cross-reference(s): 37
ST **carbon nanotube** polysulfone **nanocomposite** membrane permeability hydrophilicity immersion morphol
IT **Nanotubes**
(**carbon**, surface-**modified** with concentrated acids; multi-walled **carbon nanotubes**/polymer blend membranes)
IT Membranes, nonbiological
(composite; multi-walled **carbon nanotubes**/polymer blend membranes)
IT Pore size distribution
(diameter; multi-walled **carbon nanotubes**/polymer blend membranes)
IT Viscosity
(**dispersion** of surface-**modified** multi-walled **carbon nanotubes** in polymer for blend membranes)
IT **Disperse** systems
(**dispersion** of surface-**modified** multi-walled **carbon nanotubes** in **solvents** for polymer blend membranes)
IT Polyester fibers, uses
RL: DEV (Device component use); NUU (Other use, unclassified); USES (Uses)
(fabrics, membrane substrate; multi-walled **carbon nanotubes**/polymer blend membranes)
IT Contact angle

Nanocomposites
Wetting
(multi-walled **carbon nanotubes**/polymer blend membranes)
IT Polyoxyalkylenes, processes
RL: REM (Removal or disposal); PROC (Process)
(multi-walled **carbon nanotubes**/polymer blend membranes)
IT Polysulfones, uses
RL: DEV (Device component use); POF (Polymer in formulation); PRP (Properties); USES (Uses)
(polyether-; multi-walled **carbon nanotubes** /polymer blend membranes)
IT Polyethers, uses
RL: DEV (Device component use); POF (Polymer in formulation); PRP (Properties); USES (Uses)
(polysulfone-; multi-walled **carbon nanotubes** /polymer blend membranes)
IT Surface treatment
(surface treatment of multi-walled **carbon nanotubes** for polymer blend membranes)
IT Polymer morphology
(surface; multi-walled **carbon nanotubes** /polymer blend membranes)
IT 7664-93-9, Sulfuric acid, reactions 7697-37-2, Nitric acid, reactions
RL: RGT (Reagent); RACT (Reactant or reagent)
(concentrated, surface **modification** of **carbon nanotubes**; multi-walled **carbon nanotubes**/polymer blend membranes)
IT 25135-51-7, Udel P3500
RL: DEV (Device component use); POF (Polymer in formulation); PRP (Properties); USES (Uses)
(multi-walled **carbon nanotubes**/polymer blend membranes)
IT 872-50-4, N-Methyl-2-pyrrolidone, uses
RL: NUU (Other use, unclassified); USES (Uses)
(multi-walled **carbon nanotubes**/polymer blend membranes)
IT 9003-39-8, Polyvinylpyrrolidone 25322-68-3, Polyethyleneoxide
RL: REM (Removal or disposal); PROC (Process)
(multi-walled **carbon nanotubes**/polymer blend membranes)
IT **7440-44-0D**, Carbon, surface-**modified** with concentrated acids
RL: MOA (Modifier or additive use); USES (Uses)
(**nanotubes**; multi-walled **carbon nanotubes**/polymer blend membranes)
REFERENCE COUNT: 32 THERE ARE 32 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L56 ANSWER 2 OF 7 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2006:740459 HCAPLUS
DOCUMENT NUMBER: 145:193740
TITLE: Preparation of guanidine-**modified** **carbon nanotubes** bonded to alumina substrates via crown ether bonded **polymers** and coupling agents
INVENTOR(S): Lee, Hai Sung

PATENT ASSIGNEE(S): S. Korea
SOURCE: U.S. Pat. Appl. Publ., 19 pp.
CODEN: USXXCO
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

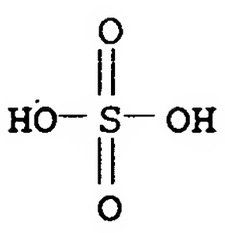
PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 2006165587	A1	20060727	US 2005-126375	200505 11
KR 2006086693	A	20060801	KR 2005-7585	200501 27
JP 2006206568	A	20060810	JP 2005-142928	200505 16

PRIORITY APPLN. INFO.: KR 2005-7585 A 200501 27

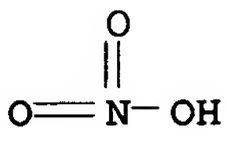
AB Guanidine groups are attached on **carbon nanotubes** to improve the **dispersibility** of **carbon nanotubes** in solns. The guanidine groups are attached on the **carbon nanotubes** by forming a carboxyl group on the **carbon nanotubes**, and then forming the guanidine group on the carboxyl group of the **carbon nanotubes.** The guanidine-**modified carbon nanotubes** are then attached to substrates (such as alumina) by coating the substrate with a **polymer** having an attached crown ether before drying the **polymer** layer and coating the semi-dried **polymer** layer with a solution including **carbon nanotubes** having guanidine groups **dispersed.** The **carbon nanotubes** are hydrogen-bonded with the solvent mol. capable of reacting with the guanidine group to form the hydrogen bond, and thus, are uniformly **dispersed** in the solvent. Further, by using the properties of a guanidine group capable of being selectively combined with crown ether, the **carbon nanotubes** having guanidine groups are aligned perpendicularly on the substrate at regular intervals.

IT **7664-93-9, Sulfuric acid**, uses
7697-37-2, Nitric acid, uses
RL: NUU (Other use, unclassified); USES (Uses)
(preparation of guanidine-**modified carbon nanotubes** bonded to alumina substrates via crown ether bonded **polymers** and coupling agents)

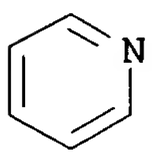
RN 7664-93-9 HCAPLUS
CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



RN 7697-37-2 HCAPLUS
CN Nitric acid (8CI, 9CI) (CA INDEX NAME)



IT **110-86-1**, **Pyridine**, uses
RL: NUU (Other use, unclassified); USES (Uses)
(solvent; preparation of guanidine-**modified carbon nanotubes** bonded to alumina substrates via crown ether bonded **polymers** and coupling agents)
RN 110-86-1 HCAPLUS
CN Pyridine (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)



INCL 423447100; 427402000; 427372200; 977847000
CC 57-8 (Ceramics)
Section cross-reference(s): 38
ST guanidine **carbon nanotube** crown ether **polymer** bonding coupling agent
IT **Nanotubes**
(**carbon**; preparation of guanidine-**modified carbon nanotubes** bonded to alumina substrates via crown ether bonded **polymers** and coupling agents)
IT Electrodeposition
Electrophoresis
(guanidine-**modified carbon nanotubes** attached by; preparation of guanidine-**modified carbon nanotubes** bonded to alumina substrates via crown ether bonded **polymers** and coupling agents)
IT Functional groups
(guanidino group, on **carbon nanotubes**; preparation of guanidine-**modified carbon nanotubes** bonded to alumina substrates via crown ether bonded **polymers** and coupling agents)
IT Carboxyl group
(on **carbon nanotubes**; preparation of guanidine-**modified carbon nanotubes** bonded to alumina substrates via crown ether bonded **polymers** and coupling agents)
IT Polyacetylenes, processes
Polyanilines
Polyphenyls
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)
(on substrates; preparation of guanidine-**modified carbon nanotubes** bonded to alumina substrates via crown ether bonded **polymers** and coupling agents)
IT Crown ethers
RL: CPS (Chemical process); PEP (Physical, engineering or chemical

process); PROC (Process)
(**polymer** bonded with, coating on substrates; preparation of guanidine-**modified carbon nanotubes** bonded to alumina substrates via crown ether bonded **polymers** and coupling agents)

IT Conducting **polymers**
(polypyrroles, on substrates; preparation of guanidine-**modified carbon nanotubes** bonded to alumina substrates via crown ether bonded **polymers** and coupling agents)

IT Conducting **polymers**
(polythiophenes, on substrates; preparation of guanidine-**modified carbon nanotubes** bonded to alumina substrates via crown ether bonded **polymers** and coupling agents)

IT Coupling agents
Drying
Sonication
(preparation of guanidine-**modified carbon nanotubes** bonded to alumina substrates via crown ether bonded **polymers** and coupling agents)

IT 1344-28-1, Alumina, processes
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process)
(anodized, substrates; preparation of guanidine-**modified carbon nanotubes** bonded to alumina substrates via crown ether bonded **polymers** and coupling agents)

IT 79-37-8, Oxalic acid chloride 144-62-7, Ethanedioic acid, uses 538-75-0, Dicyclohexylcarbodiimide 25952-53-8, EDC
RL: MOA (Modifier or additive use); USES (Uses)
(coupling agents; preparation of guanidine-**modified carbon nanotubes** bonded to alumina substrates via crown ether bonded **polymers** and coupling agents)

IT 461-58-5, Cyanoguanidine 593-84-0, Guanidine thiocyanate
RL: MOA (Modifier or additive use); USES (Uses)
(group on **carbon nanotubes**; preparation of guanidine-**modified carbon nanotubes** bonded to alumina substrates via crown ether bonded **polymers** and coupling agents)

IT 9003-53-6D, sulfonated 9011-14-7D, **Polymethyl** methacrylate, derivs. 24979-70-2D, Poly(4-vinylphenol), derivs. 126213-51-2, PEDOT
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)
(on substrates; preparation of guanidine-**modified carbon nanotubes** bonded to alumina substrates via crown ether bonded **polymers** and coupling agents)

IT 14174-09-5, Dibenzo-24-crown-8 14187-32-7 17455-13-9, 18-Crown-6 ether
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)
(**polymer** bonded with, coating on substrates; preparation of guanidine-**modified carbon nanotubes** bonded to alumina substrates via crown ether bonded **polymers** and coupling agents)

IT **7664-93-9, Sulfuric acid**, uses
7697-37-2, Nitric acid, uses
RL: NUU (Other use, unclassified); USES (Uses)
(preparation of guanidine-**modified carbon nanotubes** bonded to alumina substrates via crown ether

bonded **polymers** and coupling agents)
IT 75-09-2, Methylene chloride, uses **110-86-1**, **Pyridine**, uses 123-75-1, Pyrrolidine, uses
RL: NUU (Other use, unclassified); USES (Uses)
(solvent; preparation of guanidine-**modified carbon nanotubes** bonded to alumina substrates via crown ether bonded **polymers** and coupling agents)

L56 ANSWER 3 OF 7 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2005:599713 HCAPLUS
DOCUMENT NUMBER: 144:213538
TITLE: Poly(ethylene-co-vinyl alcohol) **functionalized** single-walled **carbon nanotubes** and related **nanocomposites**
AUTHOR(S): Fernando, K. A. Shiral; Lin, Yi; Zhou, Bing; Grah, Michael; Joseph, Ronalda; Allard, Lawrence F.; Sun, Ya-Ping
CORPORATE SOURCE: Department of Chemistry and Laboratory for Emerging Materials and Technology, Clemson University, Clemson, SC, 29634-0973, USA
SOURCE: Journal of Nanoscience and Nanotechnology (2005), 5(7), 1050-1054
CODEN: JNNOAR; ISSN: 1533-4880
PUBLISHER: American Scientific Publishers
DOCUMENT TYPE: Journal
LANGUAGE: English
AB Single-walled **carbon nanotubes** (SWNTs) were **functionalized** by poly(ethylene-co-vinyl alc.) (EVOH) copolymer under carbodiimide-activated esterification reaction conditions. Similar to the parent EVOH copolymer, the EVOH-**functionalized carbon nanotubes** are soluble in highly **polar solvent** systems such as DMSO and hot ethanol-water mixts. The soluble EVOH-SWNT sample was characterized by various techniques, including optical absorption, Raman, NMR, electron microscopy, and thermogravimetric anal. The common solubility of EVOH and EVOH-SWNT allowed their intimate mixing in solution, and thus the fabrication of **nanocomposites** in which the SWNTs are homogeneously **dispersed** in the polymer matrix.
IT **7440-44-0P**, **Carbon**, preparation
RL: MOA (Modifier or additive use); PRP (Properties); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
(**nanotubes**, EVOH polymer-**modified**; ethylene-vinyl alc. copolymer-**functionalized** single-walled **carbon nanotubes** and related polymer **nanocomposites**)
RN 7440-44-0 HCAPLUS
CN Carbon (CA INDEX NAME)

C

CC 37-6 (Plastics Manufacture and Processing)
ST **carbon nanotube functionalization** ethylene vinyl alc polymer; **nanocomposite carbon nanotube** ethylene vinyl alc polymer
IT **Nanotubes**
(**carbon**, EVOH polymer-**modified**;

ethylene-vinyl alc. copolymer-**functionalized** single-walled **carbon nanotubes** and related polymer **nanocomposites**)

IT **Nanocomposites**
(ethylene-vinyl alc. copolymer-**functionalized** single-walled **carbon nanotubes** and related polymer **nanocomposites**)

IT 25067-34-9DP, Ethylene-vinyl alcohol copolymer, reaction products with **carbon nanotubes**
RL: MOA (Modifier or additive use); PRP (Properties); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
(ethylene-vinyl alc. copolymer-**functionalized** single-walled **carbon nanotubes** and related polymer **nanocomposites**)

IT 25067-34-9, Ethylene-vinyl alcohol copolymer
RL: POF (Polymer in formulation); RCT (Reactant); RACT (Reactant or reagent); USES (Uses)
(**nanocomposites**; ethylene-vinyl alc. copolymer-**functionalized** single-walled **carbon nanotubes** and related polymer **nanocomposites**)

IT **7440-44-0P**, **Carbon**, preparation
RL: MOA (Modifier or additive use); PRP (Properties); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
(**nanotubes**, EVOH polymer-**modified**; ethylene-vinyl alc. copolymer-**functionalized** single-walled **carbon nanotubes** and related polymer **nanocomposites**)

REFERENCE COUNT: 21 THERE ARE 21 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L56 ANSWER 4 OF 7 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2005:377355 HCAPLUS
DOCUMENT NUMBER: 143:442881
TITLE: Chemical **modification** of single-walled **carbon nanotubes** with peroxytrifluoroacetic acid
AUTHOR(S): Liu, Manhong; Yang, Yanlian; Zhu, Tao; Liu, Zhongfan
CORPORATE SOURCE: Center for Nanoscale Science and Technology (CNST), College of Chemistry and Molecular Engineering, Peking University, Beijing, 100871, Peop. Rep. China
SOURCE: Carbon (2005), 43(7), 1470-1478
CODEN: CRBNAH; ISSN: 0008-6223
PUBLISHER: Elsevier Ltd.
DOCUMENT TYPE: Journal
LANGUAGE: English

AB A new and simple method for chemical **modification** of single-walled **carbon nanotubes** (SWNTs) is presented. Purified SWNTs ropes prepared by chemical vapor deposition growth were reacted with peroxytrifluoroacetic acid under ultrasonication. Samples before and after treatment were characterized using Raman, FTIR, UV/visible/near-IR, XPS, and atomic force microscopy. Data from these expts. conclusively showed that, in addition to oxygen-**based functional groups**, trifluoroacetic **groups** were covalently attached to the SWNTs. Moreover, these **modified** SWNTs were shortened into .apprx.300 nm in length in the same step of **functionalization**, resulting in exfoliation of

nanotube ropes to yield small bundles and individual **nanotubes**. The resultant SWNTs were easily **dispersed** in **polar solvents** such as DMF, water and ethanol. The described peroxytrifluoroacetic acid treatment should be useful to tailor chemical and phys. properties of SWNTs and to broaden their chemical processibility and reactivity.

IT **7440-44-0, Carbon**, processes
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)
(**nanotubes**; chemical **modification** of single-walled **carbon nanotubes** with peroxytrifluoroacetic acid)

RN 7440-44-0 HCAPLUS
CN Carbon (CA INDEX NAME)

C

CC 49-1 (Industrial Inorganic Chemicals)
ST **carbon nanotube** chem **modification** peroxytrifluoroacetic acid
IT **Nanotubes**
(**carbon**; chemical **modification** of single-walled **carbon nanotubes** with peroxytrifluoroacetic acid)
IT 359-48-8, Peroxytrifluoroacetic acid
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)
(chemical **modification** of single-walled **carbon nanotubes** with peroxytrifluoroacetic acid)
IT **7440-44-0, Carbon**, processes
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)
(**nanotubes**; chemical **modification** of single-walled **carbon nanotubes** with peroxytrifluoroacetic acid)
REFERENCE COUNT: 50 THERE ARE 50 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L56 ANSWER 5 OF 7 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2004:569654 HCAPLUS
DOCUMENT NUMBER: 141:107379
TITLE: **Carbon nanotube** **dispersion** liquid and method for producing the same and **polymer** composite and method for producing the same
INVENTOR(S): Yoshizawa, Hisae; Watanabe, Hiroyuki
PATENT ASSIGNEE(S): Fuji Xerox Co., Ltd., Japan
SOURCE: U.S. Pat. Appl. Publ., 21 pp.
CODEN: USXXCO
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
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Current Application

US 2004136894	A1	20040715	US 2003-649877	20030828
JP 2004216516	A	20040805	JP 2003-7363	20030115
EP 1439248	A1	20040721	EP 2003-19570	20030902

R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR, BG, CZ, EE, HU, SK

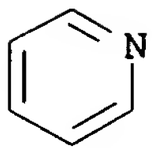
PRIORITY APPLN. INFO.: JP 2003-7363 A 20030115

AB A **carbon nanotube dispersion** liquid, comprises a **carbon nanotube modified** with a **basic** or **acidic functional group**, which is **dispersed** in a **polar solvent** having a **polarity** opposite to a **polarity** of the **functional** group. A method of producing a **carbon nanotube dispersion** liquid, comprises: adding, through introduction, a **basic** or **acidic functional group** to a **carbon nanotube**; and **dispersing** the **carbon nanotube** into a **polar solvent** having a **polarity** opposite to a **polarity** of the **functional** group. A method for producing a **polymer** composite comprises: preparing a mixture solution by mixing a **polymer** solution obtained by dissolving a **polymer** in a second **solvent** and the **carbon nanotube dispersion** liquid; and volatilizing the **polar solvent** and the second **solvent** from the mixture solution Thus, a **carbon nanotube dispersion** liquid was prepared by mixing 0.02 g of multi-wall **nanotube** (MWNT) with 14 g of 60% concentrated **nitric acid** in **pyridine**. Then 1 g of the **carbon nanotube dispersion** liq was mixed with 0.56 g of U-Varnish A to give a uniform composite with increased storage modulus and increased glass transition temperature

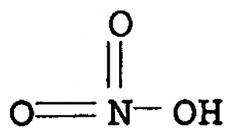
IT **7440-44-0**, **Carbon**, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(**nanotubes**; production of **carbon nanotube dispersion** liquid for **polymer** composites)
RN 7440-44-0 HCAPLUS
CN Carbon (CA INDEX NAME)

C

IT **110-86-1**, **Pyridine**, uses **7697-37-2**, **Nitric acid**, uses
RL: NUU (Other use, unclassified); USES (Uses)
(production of **carbon nanotube dispersion** liquid for **polymer** composites)
RN 110-86-1 HCAPLUS
CN Pyridine (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)



RN 7697-37-2 HCAPLUS
CN Nitric acid (8CI, 9CI) (CA INDEX NAME)



IC ICM D01F009-12
INCL 423447200
CC 38-3 (Plastics Fabrication and Uses)
Section cross-reference(s): 40, 76
ST **carbon nanotube dispersion** liq **polymer** composite
IT Reinforced plastics
RL: TEM (Technical or engineered material use); USES (Uses)
(carbon fiber-reinforced; production of **carbon nanotube dispersion** liquid for **polymer** composites)
IT **Nanotubes**
(**carbon**; production of **carbon nanotube dispersion** liquid for **polymer** composites)
IT Polyimides, uses
RL: POF (Polymer in formulation); PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(polyether-; production of **carbon nanotube dispersion** liquid for **polymer** composites)
IT Polyethers, uses
RL: POF (Polymer in formulation); PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(polyimide-; production of **carbon nanotube dispersion** liquid for **polymer** composites)
IT **7440-44-0, Carbon**, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(**nanotubes**; production of **carbon nanotube dispersion** liquid for **polymer** composites)
IT **110-86-1, Pyridine**, uses **7697-37-2, Nitric acid**, uses
RL: NUU (Other use, unclassified); USES (Uses)
(production of **carbon nanotube dispersion** liquid for **polymer** composites)
IT 26298-81-7, U-Varnish A 26615-45-2
RL: POF (Polymer in formulation); PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(production of **carbon nanotube dispersion** liquid for **polymer** composites)

L56 ANSWER 6 OF 7 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2003:501681 HCAPLUS
DOCUMENT NUMBER: 139:198193
TITLE: Surface **Modification** of Multiwalled **Carbon Nanotubes**: Toward the

Tailoring of the Interface in Polymer Composites
AUTHOR(S): Eitan, Ami; Jiang, Kuiyang; Dukes, Doug; Andrews, Rodney; Schadler, Linda S.
CORPORATE SOURCE: Materials Science and Engineering, Rensselaer Polytechnic Institute, Troy, NY, USA
SOURCE: Chemistry of Materials (2003), 15(16), 3198-3201
CODEN: CMATEX; ISSN: 0897-4756
PUBLISHER: American Chemical Society
DOCUMENT TYPE: Journal
LANGUAGE: English

AB The ability to **modify** the surface of **carbon nanotubes** is of crucial importance for their utilization in different applications. In the present paper we report on the chemical **modification** of multiwalled **carbon nanotubes** (MWNT) by means of epoxide-**based functional groups.** MWNT were first carboxylated along their walls. This was followed by further reactions to attach di-glycidyl ether of bisphenol-A-based epoxide resin. The behavior of the **modified nanotubes** in various **solvents** was altered due to the chemical changes, and anal. techniques were utilized to detect the chemical attachments. The implications of the surface **modification** achieved are discussed primarily in terms of **nanotube**-polymer composite applications.

IT **7440-44-0DP**, Carbon, carboxylated, reaction products with Epon 828
RL: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation)
(**nanotubes**; surface **modification** of multiwalled **carbon nanotubes**)
RN 7440-44-0 HCAPLUS
CN Carbon (CA INDEX NAME)

C

IT **7440-44-0P**, **Carbon**, preparation
RL: RCT (Reactant); SPN (Synthetic preparation); PREP (Preparation); RACT (Reactant or reagent)
(**nanotubes**; surface **modification** of multiwalled **carbon nanotubes**)
RN 7440-44-0 HCAPLUS
CN Carbon (CA INDEX NAME)

C

CC 37-5 (Plastics Manufacture and Processing)
ST **carbon nanotube** surface **modification** epoxy resin
IT Epoxy resins, preparation
RL: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation)
(bisphenol A diglycidyl ether-based, reaction products with carboxylated **carbon nanotubes**; surface **modification** of multiwalled **carbon nanotubes**)
IT **Nanotubes**

(**carbon**, carboxylated, reaction products with Epon 828; surface **modification** of multiwalled **carbon nanotubes**)

IT **Dispersion** (of materials)
Thermal stability
(surface **modification** of multiwalled **carbon nanotubes**)

IT Carboxyl group
(surface; surface **modification** of multiwalled **carbon nanotubes**)

IT 102-54-5, Ferrocene 1330-20-7, Xylene, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(in preparation of multiwalled **carbon nanotubes** for surface **modification**)

IT **7440-44-0DP**, Carbon, carboxylated, reaction products with Epon 828
RL: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation)
(**nanotubes**; surface **modification** of multiwalled **carbon nanotubes**)

IT **7440-44-0P**, **Carbon**, preparation
RL: RCT (Reactant); SPN (Synthetic preparation); PREP (Preparation); RACT (Reactant or reagent)
(**nanotubes**; surface **modification** of multiwalled **carbon nanotubes**)

IT 25068-38-6DP, Epon 828, reaction products with carboxylated **carbon nanotubes**
RL: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation)
(surface **modification** of multiwalled **carbon nanotubes**)

REFERENCE COUNT: 14 THERE ARE 14 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L56 ANSWER 7 OF 7 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2002:281425 HCAPLUS
DOCUMENT NUMBER: 136:371791
TITLE: Surface **modifications** of single-wall **carbon nanotubes**
AUTHOR(S): Tiano, Thomas; Roylance, Margaret; Smith, Ken
CORPORATE SOURCE: Foster-Miller, Inc., Waltham, MA, 02451, USA
SOURCE: Proceedings of the American Society for Composites, Technical Conference (2001), 16th, 307-316
CODEN: PAMTEG; ISSN: 1084-7243
PUBLISHER: CRC Press LLC
DOCUMENT TYPE: Journal; General Review; (computer optical disk)
LANGUAGE: English

AB A review of the state of the art and a summary of current work. To manufacture high performance **nanocomposites** comprising single-wall **C nanotubes** (SWNT) in organic matrixes that take advantage of the unique mech. and phys. properties of the **nanotubes**, there are 2 hurdles. Firstly strong van der Waals forces cause SWNTs to agglomerate in bundles (called ropes) and secondly, smooth **nanotube** surfaces interact only weakly with polymeric matrixes. If surface **modification** techniques are developed that can enhance SWNT **dispersion** and interaction with organic matrixes, the revolutionary properties of **C nanotubes** can be harnessed for

nanocomposite reinforcement. Early **nanotube** research focused on **functionalization** through the carboxylic **acid** SWNT end **groups**, but **modification** of the SWNT end groups alone will not provide sufficient compatibility to allow significant load transfer from organic matrixes to the body of the SWNTs. Sidewall **functionalization** performed by different methods, including fluorination followed by alkyl-lithiation, and free-radical reaction, also was employed for surface **modification** and should lead to enhanced load transfer. This approach may enhance mech. properties of SWNT composites, but it **modifies** the SWNT electronic structure and disrupts their elec. conductivity It is therefore not indicated for applications that depend upon the thermal and elec. conductivity of the **nanotube** filler. Surface compatibilization shows the highest promise as a method for increasing **dispersion** and load transfer for such applications. Previous work has achieved marked improvement in de-agglomeration of SWNT ropes, but known compatibilizers work primarily in H2O and do not lend themselves to transfer into organic matrixes. The study of polymeric **dispersants** for use in organic **solvents** is pursued.

IT **7440-44-0**, **Carbon**, processes
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)
(**nanotubes**; surface **modifications** of single-wall **carbon nanotubes**)
RN 7440-44-0 HCAPLUS
CN Carbon (CA INDEX NAME)

C

CC 49-0 (Industrial Inorganic Chemicals)
Section cross-reference(s): 66, 78
ST review surface **modification carbon nanotube** polymeric **dispersant**
IT **Nanotubes**
(**carbon**; surface **modifications** of single-wall **carbon nanotubes**)
IT Surface reaction
(surface **modifications** of single-wall **carbon nanotubes**)
IT **7440-44-0**, **Carbon**, processes
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)
(**nanotubes**; surface **modifications** of single-wall **carbon nanotubes**)
REFERENCE COUNT: 6 THERE ARE 6 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

=> d l57 ibib abs hitstr hitind 1-17

L57 ANSWER 1 OF 17 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2006:1261937 HCAPLUS
TITLE: **Functionalization** of single-walled **carbon nanotube** by the covalent **modification** with polymer

chains

AUTHOR(S): Kitano, Hiromi; Tachimoto, Kazutaka; Anraku, Yasutaka
CORPORATE SOURCE: Department of Applied Chemistry, Graduated School of Science and Engineering, University of Toyama, Toyama, 930-8555, Japan
SOURCE: Journal of Colloid and Interface Science (2007), 306(1), 28-33
CODEN: JCISA5; ISSN: 0021-9797
PUBLISHER: Elsevier
DOCUMENT TYPE: Journal
LANGUAGE: English

AB A single-walled **carbon nanotube** (SWNT), which had been oxidized by incubation with a mixture of nitric acid and sulfuric **acid** to afford carboxyl **groups** at its ends, was incubated with an azo-type radical initiator carrying poly(2-methacryloyloxyethyl -glucopyranoside) blocks at both ends (PMEGlc-initiator). Due to its high radical trapping activity, the SWNT could be coated with glycopolymers corresponding to the cloven macro-initiator (PMEGlc-SWNT). The PMEGlc-SWNT indicated a lectin (Con A, Con A)-induced aggregation, and a bucky sheet composed of PMEGlc-SWNT could be used for the recovery of Con A from its aqueous solution Furthermore, the carboxylated SWNT was also incubated with a terminal-aminated poly(N-iso-Pr acrylamide) (PIPA) and 1-ethyl-3-(3-dimethylaminopropyl)carbodiimide HCl salt (PIPA-SWNT). The PIPA-SWNT indicated a definite temperature-responsiveness in the turbidity of its **dispersion.** These methods would be promising to **modify** SWNT with various **functional** polymers.

IT INDEXING IN PROGRESS

IT **7440-44-0, Carbon**
RL: NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(**nanotubes**, single-walled; **functionalization** of single-walled **carbon nanotube** by covalent **modification** with polymer chain)

RN 7440-44-0 HCAPLUS
CN Carbon (CA INDEX NAME)

C

CC 66-4 (Surface Chemistry and Colloids)
ST **functionalization** single walled **carbon nanotube** covalent **modification** polymer chain

IT **Nanotubes**
(**carbon**, single-walled; **functionalization** of single-walled **carbon nanotube** by covalent **modification** with polymer chain)

IT Adsorption
Sols
Turbidity
(**functionalization** of single-walled **carbon nanotube** by covalent **modification** with polymer chain)

IT 11028-71-0, Con A
RL: PEP (Physical, engineering or chemical process); PROC (Process)
(**functionalization** of single-walled **carbon nanotube** by covalent **modification** with polymer

chain)
IT **7440-44-0, Carbon**
RL: NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(**nanotubes**, single-walled; **functionalization** of single-walled **carbon nanotube** by covalent **modification** with polymer chain)
REFERENCE COUNT: 35 THERE ARE 35 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L57 ANSWER 2 OF 17 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2006:1213595 HCAPLUS
DOCUMENT NUMBER: 145:491042
TITLE: Method for manufacturing chitosan/**carbon nanotube** composite by covalent grafting
INVENTOR(S): Feng, Wei; Wu, Zigang
PATENT ASSIGNEE(S): Tianjin University, Peop. Rep. China
SOURCE: Faming Zhuanli Shenqing Gongkai Shuomingshu, 7 pp.
CODEN: CNXXEV
DOCUMENT TYPE: Patent
LANGUAGE: Chinese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
CN 1861639	A	20061115	CN 2006-10014158	20060608

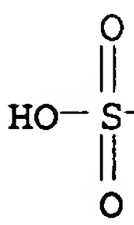
PRIORITY APPLN. INFO.: CN 2006-10014158 20060608

AB The title method comprises (1) adding 1 part multi-wall or single-wall **carbon nanotubes** to 20-60 parts mixture of 95% **sulfuric acid** and 60% **nitric acid** (volume ratio 3:1), ultrasonically-treating for 10-30 min, heating to reflux for 1-6 h, filtering to remove acid, washing with deionized water for 1-5 times till pH of water phase is 5-7, and drying in vacuum at 40-80° for 12-24 h to form acidified multi-wall or single-wall **carbon nanotubes**, (2) mixing the acidified multi-wall or single-wall **carbon nanotubes** with thionyl chloride, ultrasonically-treating for 10-30 min, heating to 65-70° and reacting for 12-36 h, centrifugating to remove thionyl chloride, washing solid substance with anhydrous THF for 1-5 times, and vacuum-drying solid substance at 40-80° for 12-24 h to give acyl-chlorinated multi-wall or single-wall **carbon nanotubes**, and (3) **dispersing** the multi-wall or single-wall **carbon nanotubes** and chitosan in one or two solvents selected from N,N-dimethylformamide, N,N-dimethylacetamide, and **pyridine**, ultrasonically-treating for 10-30 min, performing reaction at 120-140° under nitrogen protection for 72-120 h, filtering to remove solvent, washing solid substance with acetic acid to remove residual chitosan, and vacuum-drying solid substance at 40-80° for 12-24 h to give covalent-grafted chitosan/**carbon**

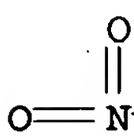
nanotube composite. The chitosan/**carbon** **nanotube** composite has the advantages of simple manufacture process, good binding strength, and good solubility and **dispersibility** in organic acid such as formic acid, benzoic acid and acetic acid, and can be used in biomedical field.

IT **7664-93-9, Sulfuric acid**, reactions
7697-37-2, Nitric acid, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(method for manufacturing chitosan/**carbon nanotube** composite by covalent grafting)

RN 7664-93-9 HCAPLUS
CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



RN 7697-37-2 HCAPLUS
CN Nitric acid (8CI, 9CI) (CA INDEX NAME)



IT **7440-44-0P, Carbon**, preparation
RL: BUU (Biological use, unclassified); IMF (Industrial manufacture); TEM (Technical or engineered material use); BIOL (Biological study); PREP (Preparation); USES (Uses)
(**nanotubes**, chitosan-grafted; method for manufacturing chitosan/**carbon nanotube** composite by covalent grafting)

RN 7440-44-0 HCAPLUS
CN Carbon (CA INDEX NAME)

C

CC 44-5 (Industrial Carbohydrates)
Section cross-reference(s): 73

ST chitosan **carbon nanotube** composite covalent grafting

IT **Nanotubes**
(**carbon**, chitosan-grafted; method for manufacturing chitosan/**carbon nanotube** composite by covalent grafting)

IT **Nanocomposites**
(method for manufacturing chitosan/**carbon nanotube** composite by covalent grafting)

IT 9012-76-4P, Chitosan
RL: BUU (Biological use, unclassified); IMF (Industrial manufacture); TEM (Technical or engineered material use); BIOL (Biological study); PREP (Preparation); USES (Uses)
(grafted on **carbon nanotube**; method for manufacturing chitosan/**carbon nanotube** composite by

covalent grafting)
IT **7664-93-9**, **Sulfuric acid**, reactions
7697-37-2, **Nitric acid**, reactions
7719-09-7, Thionyl chloride
RL: RCT (Reactant); RACT (Reactant or reagent)
(method for manufacturing chitosan/**carbon nanotube** composite by covalent grafting)
IT **7440-44-0P**, **Carbon**, preparation
RL: BUU (Biological use, unclassified); IMF (Industrial manufacture); TEM (Technical or engineered material use); BIOL (Biological study); PREP (Preparation); USES (Uses)
(**nanotubes**, chitosan-grafted; method for manufacturing chitosan/**carbon nanotube** composite by covalent grafting)

L57 ANSWER 3 OF 17 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2006:916640 HCAPLUS
DOCUMENT NUMBER: 145:326120
TITLE: Conductive inks for metal pattern formation in printed circuits
INVENTOR(S): Chung, Kwang-Choon; Cho, Hyun-Nam; Gong, Myoung-Seon; Han, Yi-Sup; Park, Jeong-Bin; Nam, Dong-Hun; Uhm, Seong-Yong; Seo, Young-Kwan; Cho, Nam-Boo
PATENT ASSIGNEE(S): Inktec Co., Ltd., S. Korea
SOURCE: PCT Int. Appl., 96pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2006093398	A1	20060908	WO 2006-KR754	20060304

W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KZ, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW
RW: AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG, BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM

KR 2006097271	A	20060914	KR 2005-18364	20050304
KR 2006101570	A	20060926	KR 2005-23013	20050321
KR 2006108875	A	20061018	KR 2005-31090	20050414

PRIORITY APPLN. INFO.: KR 2005-18364 A

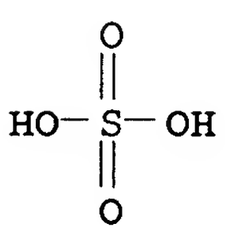
			200503 04
	KR 2005-23013	A	200503 21
	KR 2005-31090	A	200504 14
	KR 2005-34371	A	200504 26

OTHER SOURCE(S): MARPAT 145:326120

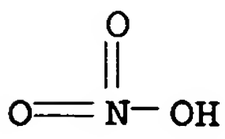
AB The present invention relates to a variety of conductive ink compns. comprising a metal complex compound having a special structure and an additive and a method for preparing the same. More particularly, the invention relates to conductive ink compns. comprising a metal complex compound obtained by reacting a metal or metal compound with an NH4+ carbamate- or NH4+ carbonate-based compound and an additive and a method for preparing the same.

IT **7664-93-9**, **Sulfuric acid**, uses
7697-37-2, **Nitric acid**, uses
RL: NUU (Other use, unclassified); USES (Uses)
(conductive ink oxidizer component; conductive inks for metal pattern formation in printed circuits)

RN 7664-93-9 HCAPLUS
CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)

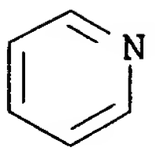


RN 7697-37-2 HCAPLUS
CN Nitric acid (8CI, 9CI) (CA INDEX NAME)

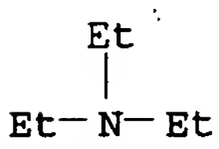


IT **110-86-1**, **Pyridine**, uses **121-44-8**, **Triethylamine**, uses
RL: NUU (Other use, unclassified); USES (Uses)
(conductive ink stabilizer component; conductive inks for metal pattern formation in printed circuits)

RN 110-86-1 HCAPLUS
CN Pyridine (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)



RN 121-44-8 HCAPLUS
CN Ethanamine, N,N-diethyl- (9CI) (CA INDEX NAME)



CC 76-2 (Electric Phenomena)
Section cross-reference(s): 42

IT **Nanotubes**
(**carbon**, conductive ink metal component; conductive inks for metal pattern formation in printed circuits)

IT Acrylic **polymers**, uses
Alkyd **resins**
Epoxy **resins**, uses
Petroleum **resins**
Phenolic **resins**, uses
Polyamides, uses
Polyesters, uses
Polyethers, uses
Polyolefins
Polysiloxanes, uses
Polyurethanes, uses
Rosin
RL: NUU (Other use, unclassified); USES (Uses)
(conductive ink binder component; conductive inks for metal pattern formation in printed circuits)

IT Binders
Dispersing agents
Leveling agents
Oxidizing agents
Reducing agents
Stabilizing agents
Surfactants
Thixotropic agents
Wetting agents
(conductive ink component; conductive inks for metal pattern formation in printed circuits)

IT Conducting **polymers**
(conductive ink metal component; conductive inks for metal pattern formation in printed circuits)

IT Vinyl compounds, uses
RL: NUU (Other use, unclassified); USES (Uses)
(**polymers**, conductive ink binder component; conductive inks for metal pattern formation in printed circuits)

IT 9003-08-1, Melamine **resin** 9004-34-6, Cellulose, uses
9011-05-6, Urea **resin** 25053-15-0, Diallyl phthalate **resin** 25722-06-9, PolyOxetane 95270-88-5, PolyFluorene
RL: NUU (Other use, unclassified); USES (Uses)
(conductive ink binder component; conductive inks for metal pattern formation in printed circuits)

IT 64-19-7, Acetic acid, uses 75-98-9, Trimethyl acetic acid
76-05-1, Trifluoroacetic acid, uses 103-82-2, Phenylacetic acid, uses 463-79-6, Carbonic acid, uses 1313-60-6, Sodium peroxide 1878-65-5 7553-56-2, Iodine, uses 7632-04-4, Sodium borate (NaBO3) 7637-03-8, Ammonium cerium sulfate ((NH4)4Ce(SO4)4) **7664-93-9, Sulfuric acid**, uses
7697-37-2, Nitric acid, uses
7705-08-0, Ferric chloride, uses 7722-64-7, Potassium permanganate 7722-84-1, Hydrogen peroxide, uses 7722-86-3, Peroxymonosulfuric acid 7727-21-1, Potassium peroxydisulfate (K2S2O8) 7727-54-0, Ammonium peroxydisulfate ((NH4)2S2O8) 7775-27-1, Sodium peroxydisulfate (Na2S2O8) 7782-44-7, Oxygen, uses 7789-00-6 7790-28-5, Sodium periodate (NaIO4) 10028-15-6, Ozone, uses 10028-22-5, Iron sulfate (Fe2(SO4)3) 10045-89-3 10058-23-8, Potassium peroxymonosulfate (KHSO5) 10421-48-4, Iron nitrate (Fe(NO3)3) 12030-88-5, Potassium superoxide 13746-66-2, Iron potassium cyanide (FeK3(CN)6)
RL: NUU (Other use, unclassified); USES (Uses)
(conductive ink oxidizer component; conductive inks for metal pattern formation in printed circuits)

IT 62-53-3, Aniline, uses 67-62-9, Methoxyamine 74-89-5, Methylamine, uses 75-04-7, Ethylamine, uses 75-31-0, Isopropylamine, uses 78-81-9, Isobutylamine 78-90-0, Propylenediamine 78-96-6, 2-Hydroxypropylamine 100-46-9, Benzylamine, uses 102-71-6, Triethanolamine, uses 104-75-6, 2-Ethylhexylamine 104-94-9 107-10-8, n-Propylamine, uses 107-11-9, Allylamine 107-15-3, Ethylenediamine, uses 107-85-7, Isoamylamine 108-91-8, Cyclohexylamine, uses 109-73-9, n-Butylamine, uses 109-85-3 109-89-7, Diethylamine, uses 109-97-7, Pyrrole 110-85-0, Piperazine, uses **110-86-1**, **Pyridine**, uses 110-89-4, Piperidine, uses 110-91-8, Morpholine, uses 111-26-2, n-Hexylamine 111-42-2, Diethanolamine, uses 111-49-9 111-68-2, n-Heptylamine 111-86-4, n-Octylamine 112-20-9, Nonylamine **121-44-8**, **Triethylamine**, uses 124-09-4, Hexamethylenediamine, uses 124-22-1, Dodecylamine 124-30-1, Octadecylamine 141-43-5, 2-Ethanolamine, uses 142-84-7, Dipropylamine 143-27-1, Hexadecylamine 280-57-9, Triethylenediamine 288-32-4, Imidazole, uses 624-86-2, Ethoxyamine 765-30-0, Cyclopropylamine 919-30-2, 3-Aminopropyltriethoxysilane 929-59-9 1003-03-8, Cyclopentylamine 1321-35-3, Isooctylamine 1336-21-6, Ammonium hydroxide 2016-57-1, Decylamine 5622-77-5, n-Butoxyamine 7803-49-8, Hydroxyamine, uses 9002-98-6 13822-56-5, 3-Aminopropyltrimethoxysilane 22483-09-6, Aminoacetaldehyde dimethyl acetal 30551-89-4, Polyallylamine 34447-10-4 92260-07-6, Aminobenzonitrile
RL: NUU (Other use, unclassified); USES (Uses)
(conductive ink stabilizer component; conductive inks for metal pattern formation in printed circuits)

REFERENCE COUNT: 4 THERE ARE 4 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L57 ANSWER 4 OF 17 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2006:864357 HCAPLUS
TITLE: Properties of surface **modified** multiwalled **carbon nanotube** -filled PET composite film
AUTHOR(S): Jin, Sanghyun; Yoon, Kwan Han
CORPORATE SOURCE: Department of Polymer Science & Engineering,

Kumoh National Institute of Technology, Gumi, 730-701, S. Korea
SOURCE: Abstracts of Papers, 232nd ACS National Meeting, San Francisco, CA, United States, Sept. 10-14, 2006 (2006), PMSE-409. American Chemical Society: Washington, D. C.
CODEN: 69IHRD
DOCUMENT TYPE: Conference; Meeting Abstract; (computer optical disk)
LANGUAGE: English
AB Poly(ethylene terephthalate) (PET)/Multi-walled **carbon nanotube** (MWNT) composites were prepared by in-situ polymerization. In order to improve the **dispersion** of MWNT in PET matrix, the **functionalized** MWNT having **acid groups** (**acid**-MWNT) and acetic **groups** (acetic-MWNT) on the surface of MWNT was used. The **functional** groups on the surface of MWNT were confirmed by IR spectrometer (IR). The acetic-MWNT showed a better **dispersion** than neat-MWNT and acid-MWNT in PET matrix, based on SEM characterization. The reaction between PET and acetic-MWNT occurred, which was confirmed through the shifting of the G band to higher frequency in Raman spectroscopy and the increase of the complex viscosity in rheol. properties. The composites containing **functionalized** MWNT showed a large increase in the tensile strength and mudulus, especially the composite containing 0.5 wt% of **functionalized** MWNT. The values of the strength and modulus of PET/acetic-MWNT composite was larger than that of PET/acid-MWNT composite.

L57 ANSWER 5 OF 17 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2006:240848 HCAPLUS
DOCUMENT NUMBER: 144:295177
TITLE: Method for preparing high water-soluble **carbon nanotubes**
INVENTOR(S): Chen, Chunhai; Hu, Nantao; Zhou, Hongwei; Dang, Guodong
PATENT ASSIGNEE(S): Jilin University, Peop. Rep. China
SOURCE: Faming Zhuanli Shenqing Gongkai Shuomingshu, 15 pp.
CODEN: CNXXEV
DOCUMENT TYPE: Patent
LANGUAGE: Chinese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
CN 1733602	A	20060215	CN 2005-10016888	200506 17
PRIORITY APPLN. INFO.:			CN 2005-10016888	200506 17

AB The title method comprises the following steps: (1) mounting condensation device and NO2 treating device on the three-necked bottle, adding **C nanotubes** and **HNO3** solution, reacting under refluxing at 60-80° and magnetic stirring or mech. stirring for 2-36 h, cooling to room temperature, diluting

with water, stewing until the **C nanotubes** is completely precipitated, decanting supernatant, filtering lower **suspension** liquid with 0.22 μm polytetrafluoroethylene film, water washing until the pH of filtrate is 6-7, vacuum drying 60° for 24 h to obtain purified **C nanotubes** ; (2) adding purified **C nanotubes** to flask, adding SOCl2 and DMF or **pyridine** acid absorbent, refluxing at 65° for 2-36h, cooling to room temperature, filtering with 0.22 μm polytetrafluoroethylene film, washing with THF to remove residual SOCl2, vacuum drying at room temperature for 2-5h to obtain acylated **C nanotubes**; (3) placing the acylated **C nanotubes** in a container, adding DMAc solvent and L-lysine as grafting material, **pyridine** as acid absorbent, proceeding water wash ultrasonic for 0.5-4h, amidation reacting under magnetic stirring for 2-36h, filtering with 0.22 μm polytetrafluoroethylene film, DMAc cleaning cake for 3-5 times, water washing for 5-6 times, vacuum drying at 60° for 12h to obtain water-soluble **C nanotubes.** The **C nanotubes** are multi-wall **C nanotubes** or single-wall **C nanotubes.** The title **C nanotubes** has high water solubility and high biol. compatibility.

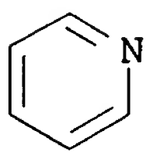
IT **7440-44-0DP, Carbon**, acylated, graft derivs.
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); SPN (Synthetic preparation); PREP (Preparation); PROC (Process)
(**nanotubes**, multiwalled, single-walled; preparation of high water-soluble **carbon nanotubes**)

RN 7440-44-0 HCAPLUS
CN Carbon (CA INDEX NAME)

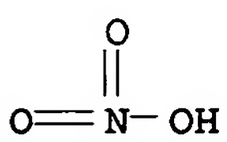
C

IT **110-86-1D, Pyridine**, derivs. **7697-37-2, Nitric acid**, processes
RL: CPS (Chemical process); NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(preparation of high water-soluble **carbon nanotubes**)

RN 110-86-1 HCAPLUS
CN Pyridine (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)



RN 7697-37-2 HCAPLUS
CN Nitric acid (8CI, 9CI) (CA INDEX NAME)



CC 49-1 (Industrial Inorganic Chemicals)
Section cross-reference(s): 57, 63
ST water soluble **carbon nanotube** prepn acylation graft deriv
IT Ceramics
(biocompatible; preparation of high water-soluble **carbon nanotubes**)
IT **Nanotubes**
(**carbon**, multiwalled, single-walled, water-soluble; preparation of high water-soluble **carbon nanotubes**)
IT Prosthetic materials and Prosthetics
(preparation of high water-soluble **carbon nanotubes**)
IT Fluoropolymers, uses
RL: NUU (Other use, unclassified); TEM (Technical or engineered material use); USES (Uses)
(preparation of high water-soluble **carbon nanotubes**)
IT **7440-44-0DP**, **Carbon**, acylated, graft derivs.
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); SPN (Synthetic preparation); PREP (Preparation); PROC (Process)
(**nanotubes**, multiwalled, single-walled; preparation of high water-soluble **carbon nanotubes**)
IT 56-87-1, L-Lysine, processes 68-12-2, DMF, processes 109-99-9, THF, processes **110-86-1D**, **Pyridine**, derivs. 127-19-5, DMAc **7697-37-2**, **Nitric acid**, processes 7719-09-7, Thionyl chloride 10102-44-0, Nitrogen dioxide, processes
RL: CPS (Chemical process); NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(preparation of high water-soluble **carbon nanotubes**)
IT 9002-84-0, PTFE
RL: NUU (Other use, unclassified); TEM (Technical or engineered material use); USES (Uses)
(preparation of high water-soluble **carbon nanotubes**)

L57 ANSWER 6 OF 17 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2006:142532 HCAPLUS
DOCUMENT NUMBER: 144:213958
TITLE: Articles having electrically conductive surface layer containing **carbon nanotubes**, and their manufacture
INVENTOR(S): Momose, Fumino; Takahashi, Haruko; Saito, Takashi; Toyama, Masayuki
PATENT ASSIGNEE(S): Mitsubishi Rayon Co., Ltd., Japan
SOURCE: Jpn. Kokai Tokkyo Koho, 26 pp.
CODEN: JKXXAF
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2006045383	A	20060216	JP 2004-229549	200408 05
PRIORITY APPLN. INFO.:			JP 2004-229549	200408

05

AB The articles are manufactured by forming an article on an elec. conductive coating film which contains **carbon nanotubes** and elec. conducting **polymers** and is formed on a surface of a substrate, and then removing the substrate. Thus, 2-aminoanisole-4-**sulfonic acid** was **polymerized** in the presence of **Et3N** and (NH4)2S2O8 at 25° for 12 h to give an elec. conducting **polymer** [poly(2-sulfo-5-methoxy-1,4-iminophenylene)]. A composition containing the conducting **polymer** 5, **carbon nanotubes** 0.4, and H2O 100 parts was applied on a glass substrate and dried to give an elec. conductive coating film. An acetone solution containing poly(Me methacrylate) was cast on the elec. conductive coating film and dried to given an article, which was removed from the substrate and washed with running water. The article showed surface resistivity 6.3 + 103 Ω, tital light transmittance 84%, and colorless uniform appearance of the elec. conductive surface.

IT **7440-44-0, Carbon**, uses
RL: MOA (Modifier or additive use); PEP (Physical, engineering or chemical process); PYP (Physical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(**nanotubes**; manufacture of articles having elec. conductive **polymer** surface layer containing uniformly **dispersed carbon nanotubes**)
RN 7440-44-0 HCAPLUS
CN Carbon (CA INDEX NAME)

C

CC 38-3 (Plastics Fabrication and Uses)
Section cross-reference(s): 37, 76
ST elec conductive film polyaniline **carbon nanotube** ; **polymethacrylate** conducting **polymer** coating **carbon nanotube**
IT **Nanotubes**
(**carbon**; manufacture of articles having elec. conductive **polymer** surface layer containing uniformly **dispersed carbon nanotubes**)
IT Films
(elec. conductive; manufacture of articles having elec. conductive **polymer** surface layer containing uniformly **dispersed carbon nanotubes**)
IT Electric conductors
(films; manufacture of articles having elec. conductive **polymer** surface layer containing uniformly **dispersed carbon nanotubes**)
IT Surfactants
(in **carbon nanotube**-containing **polymer** composition; manufacture of articles having elec. conductive **polymer** surface layer containing uniformly **dispersed carbon nanotubes**)
IT Sound and Ultrasound
(irradiation; manufacture of articles having elec. conductive **polymer** surface layer containing uniformly **dispersed carbon nanotubes**)
IT Casting of **polymeric** materials
Conducting **polymers**

(manufacture of articles having elec. conductive **polymer** surface layer containing uniformly **dispersed carbon nanotubes**)

IT Molded plastics, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(manufacture of articles having elec. conductive **polymer** surface layer containing uniformly **dispersed carbon nanotubes**)

IT Bases, uses
RL: MOA (Modifier or additive use); USES (Uses)
(solubilizer in **carbon nanotube**-containing **polymer** composition; manufacture of articles having elec. conductive **polymer** surface layer containing uniformly **dispersed carbon nanotubes**)

IT Polyanilines
RL: IMF (Industrial manufacture); PEP (Physical, engineering or chemical process); POF (Polymer in formulation); PYP (Physical process); TEM (Technical or engineered material use); PREP (Preparation); PROC (Process); USES (Uses)
(sulfo-containing; manufacture of articles having elec. conductive **polymer** surface layer containing uniformly **dispersed carbon nanotubes**)

IT 105009-55-0P, m-Aminobenzenesulfonic acid **homopolymer**
167860-86-8P, 2-Aminoanisole-4-**sulfonic acid homopolymer**
RL: IMF (Industrial manufacture); PEP (Physical, engineering or chemical process); POF (Polymer in formulation); PYP (Physical process); TEM (Technical or engineered material use); PREP (Preparation); PROC (Process); USES (Uses)
(manufacture of articles having elec. conductive **polymer** surface layer containing uniformly **dispersed carbon nanotubes**)

IT 9011-14-7P, Poly(methyl methacrylate) 25034-86-0P, Methyl methacrylate-styrene **copolymer** 25852-37-3P, Butyl acrylate-methyl methacrylate **copolymer**
RL: IMF (Industrial manufacture); PEP (Physical, engineering or chemical process); PYP (Physical process); TEM (Technical or engineered material use); PREP (Preparation); PROC (Process); USES (Uses)
(manufacture of articles having elec. conductive **polymer** surface layer containing uniformly **dispersed carbon nanotubes**)

IT 9011-87-4, Methyl acrylate-methyl methacrylate **copolymer**
RL: PEP (Physical, engineering or chemical process); PYP (Physical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(manufacture of articles having elec. conductive **polymer** surface layer containing uniformly **dispersed carbon nanotubes**)

IT **7440-44-0, Carbon**, uses
RL: MOA (Modifier or additive use); PEP (Physical, engineering or chemical process); PYP (Physical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(**nanotubes**; manufacture of articles having elec. conductive **polymer** surface layer containing uniformly **dispersed carbon nanotubes**)

IT 27176-87-0, Dodecylbenzenesulfonic acid
RL: MOA (Modifier or additive use); USES (Uses)
(surfactant in **carbon nanotube**-containing **polymer** composition; manufacture of articles having elec.

conductive **polymer** surface layer containing uniformly **dispersed carbon nanotubes**)

L57 ANSWER 7 OF 17 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2005:1282876 HCAPLUS
DOCUMENT NUMBER: 144:23581
TITLE: Compositions containing **carbon nanotubes**, composites of films containing them and method for their manufacture
INVENTOR(S): Saito, Takashi
PATENT ASSIGNEE(S): Mitsubishi Rayon Co., Ltd., Japan
SOURCE: Jpn. Kokai Tokkyo Koho, 27 pp.
CODEN: JKXXAF
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

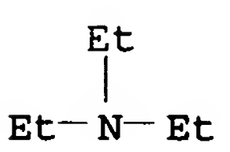
PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2005336341	A	20051208	JP 2004-157700	200405 27

PRIORITY APPLN. INFO.: JP 2004-157700 200405 27

OTHER SOURCE(S): MARPAT 144:23581

AB The compns. with good film coatability and retention of **carbon nanotube dispersibility** and shape, giving coat films with good water and weather resistance, contain (A) conductive **polymers**, (B) solvents, (C) **carbon nanotubes** and other optional components such as **polymers**, basic compds., surfactants, silane coupling agents, and **colloidal** silica, and are obtained by dilution of stock solution containing the above with a solvent. Thus, mixing poly(2-sulfo-5-methoxy-1,4-iminophenylene) 1 and **carbon nanotubes** 2.0 with water 100 parts gave a stock solution which was diluted with 1900 parts water to give a composition Coating the composition on a glass surface and drying at 80° for 5 min gave a coat film with surface resistance 2.6x10 Ω, visible light transmission 82% and good appearance.

IT **121-44-8**, **Triethylamine**, uses
RL: MOA (Modifier or additive use); USES (Uses)
(compns. containing **carbon nanotubes**, composites of films containing them and method for their manufacture)
RN 121-44-8 HCAPLUS
CN Ethanamine, N,N-diethyl- (9CI) (CA INDEX NAME)



IT **7440-44-0**, **Carbon**, properties
RL: MOA (Modifier or additive use); PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(**nanotubes**; compns. containing **carbon**

nanotubes, composites of films containing them and method for their manufacture)
RN 7440-44-0 HCAPLUS
CN Carbon (CA INDEX NAME)

C

IC ICM C08L101-12
ICS B05D005-12; B05D007-24; B32B027-28; C08K003-04; C08K003-36; C08K005-00; C08K005-541; C09D005-24; C09D007-12; C09D201-00
CC 37-6 (Plastics Manufacture and Processing)
Section cross-reference(s): 42
ST **carbon nanotube** contg elec conductive **polymer** coating compn
IT **Nanotubes**
(**carbon**; compns. containing **carbon nanotubes**, composites of films containing them and method for their manufacture)
IT Glass, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(coated substrate; compns. containing **carbon nanotubes**, composites of films containing them and method for their manufacture)
IT Coating materials
Composites
Conducting **polymers**
Surfactants
(compns. containing **carbon nanotubes**, composites of films containing them and method for their manufacture)
IT Polyanilines
RL: IMF (Industrial manufacture); POF (Polymer in formulation); PRP (Properties); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(compns. containing **carbon nanotubes**, composites of films containing them and method for their manufacture)
IT Bases, uses
RL: MOA (Modifier or additive use); USES (Uses)
(compns. containing **carbon nanotubes**, composites of films containing them and method for their manufacture)
IT Polyesters, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(compns. containing **carbon nanotubes**, composites of films containing them and method for their manufacture)
IT Silanes
RL: MOA (Modifier or additive use); USES (Uses)
(coupling agents; compns. containing **carbon nanotubes**, composites of films containing them and method for their manufacture)
IT Coupling agents
(silanes; compns. containing **carbon nanotubes**, composites of films containing them and method for their manufacture)
IT 25038-59-9, PET polyester, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(coated substrate; compns. containing **carbon nanotubes**, composites of films containing them and method for their manufacture)
IT 7631-86-9, **Colloidal** silica, uses
RL: MOA (Modifier or additive use); USES (Uses)

(**colloidal**; compns. containing **carbon nanotubes**, composites of films containing them and method for their manufacture)

IT 25233-30-1P, Polyaniline 105009-55-0P, m-Aminobenzenesulfonic acid **homopolymer** 167860-86-8P, 2-Aminoanisol-4-**sulfonic acid homopolymer**
RL: IMF (Industrial manufacture); POF (Polymer in formulation); PRP (Properties); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(compns. containing **carbon nanotubes**, composites of films containing them and method for their manufacture)

IT **121-44-8**, **Triethylamine**, uses 2530-83-8, 3-Glycidoxypropyltrimethoxysilane 7664-41-7, Ammonia, uses 27176-87-0, Dodecylbenzenesulfonic acid
RL: MOA (Modifier or additive use); USES (Uses)
(compns. containing **carbon nanotubes**, composites of films containing them and method for their manufacture)

IT 67-56-1, Methanol, uses 872-50-4, N-Methyl-2-pyrrolidone, uses 7732-18-5, Water, uses
RL: NUU (Other use, unclassified); USES (Uses)
(compns. containing **carbon nanotubes**, composites of films containing them and method for their manufacture)

IT 491828-15-0, Dianal MX 1845
RL: POF (Polymer in formulation); PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(compns. containing **carbon nanotubes**, composites of films containing them and method for their manufacture)

IT **7440-44-0**, **Carbon**, properties
RL: MOA (Modifier or additive use); PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(**nanotubes**; compns. containing **carbon nanotubes**, composites of films containing them and method for their manufacture)

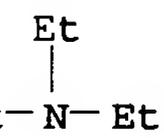
L57 ANSWER 8 OF 17 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2005:352498 HCAPLUS
DOCUMENT NUMBER: 143:104090
TITLE: An explanation of **dispersion** states of single-walled **carbon nanotubes** in solvents and aqueous surfactant solutions using solubility parameters
AUTHOR(S): Ham, Hyeong Taek; Choi, Yeong Suk; Chung, In Jae
CORPORATE SOURCE: Department of Chemical and Biomolecular Engineering, KAIST (Korea Advanced Institute of Science and Technology), 373-1 Guseong-dong, Yuseongu, Daejeon, S. Korea
SOURCE: Journal of Colloid and Interface Science (2005), 286(1), 216-223
CODEN: JCISA5; ISSN: 0021-9797
PUBLISHER: Elsevier
DOCUMENT TYPE: Journal
LANGUAGE: English
AB **Dispersions** of single-walled **C nanotubes** in various solvents and aqueous surfactant **emulsions** were studied to correlate the degree of **dispersion** state with Hansen solubility parameters ($\delta 2t = \delta 2d+\delta 2p+\delta 2h$). The **nanotubes** were **dispersed** or **suspended** very well in the solvents with certain **dispersive** component (δd) values. They were precipitated in the solvents with high polar component (δp) values or

hydrogen-bonding component (δh) values. The solvents in the **dispersed** group occupied a certain region in a 3-dimensional space of 3 components. The surfactants with a lipophilic group equal to and longer than decyl, containing 9 methylene groups and 1 Me group, contributed to the **dispersion** of **nanotubes** in H2O. The surfactants in the **dispersed** group had a lower limit in the **dispersive** component (δd) of the Hansen parameter.

IT **7440-44-0**, **Carbon**, properties
RL: PRP (Properties)
(**nanotubes**; explanation of **dispersion** states of single-walled **carbon nanotubes** in solvents and aqueous surfactant solns. using solubility parameters)
RN 7440-44-0 HCAPLUS
CN Carbon (CA INDEX NAME)

C

IT **121-44-8**, **Triethylamine**, properties
RL: PRP (Properties)
(surfactant; explanation of **dispersion** states of single-walled **carbon nanotubes** in solvents and aqueous surfactant solns. using solubility parameters)
RN 121-44-8 HCAPLUS
CN Ethanamine, N,N-diethyl- (9CI) (CA INDEX NAME)



CC 66-4 (Surface Chemistry and Colloids)
ST **dispersion carbon nanotube** surfactant **emulsion** soly
IT **Nanotubes**
(**carbon**; explanation of **dispersion** states of single-walled **carbon nanotubes** in solvents and aqueous surfactant solns. using solubility parameters)
IT **Dispersion** (of materials)
Solubility
Solvents
Surfactants
(explanation of **dispersion** states of single-walled **carbon nanotubes** in solvents and aqueous surfactant solns. using solubility parameters)
IT **7440-44-0**, **Carbon**, properties
RL: PRP (Properties)
(**nanotubes**; explanation of **dispersion** states of single-walled **carbon nanotubes** in solvents and aqueous surfactant solns. using solubility parameters)
IT 71-41-0, 1-Pentyl alcohol, properties
RL: PRP (Properties)
(solvent, surfactant; explanation of **dispersion** states of single-walled **carbon nanotubes** in solvents and aqueous surfactant solns. using solubility parameters)
IT 64-17-5, Ethanol, properties 67-56-1, Methanol, properties
67-63-0, 2-Propyl alcohol, properties 67-64-1, Acetone, properties

67-66-3, Chloroform, properties 67-68-5, Dimethyl sulfoxide, properties 68-12-2, N,N-Dimethylformamide, properties 71-43-2, Benzene, properties 75-09-2, Dichloromethane, properties 80-62-6, Methyl methacrylate 90-05-1, o-Methoxyphenol 100-42-5, Styrene, properties 107-13-1, Acrylonitrile, properties 108-88-3, Toluene, properties 109-99-9, Tetrahydrofuran, properties 110-54-3, Hexane, properties 872-50-4, 1-Methyl-2-pyrrolidone, properties 7732-18-5, Water, properties
RL: PRP (Properties)
(solvent; explanation of **dispersion** states of single-walled **carbon nanotubes** in solvents and aqueous surfactant solns. using solubility parameters)

IT 111-26-2, Hexylamine 111-87-5, 1-Octanol, properties **121-44-8**, **Triethylamine**, properties 124-22-1, Dodecylamine 124-30-1, Octadecylamine 142-31-4, Sodium octyl sulfate 143-27-1, Hexadecylamine 151-21-3, Sodium dodecyl sulfate, properties 1120-04-3, Sodium octadecyl sulfate 1984-06-1 2016-57-1, Decylamine 25155-30-0, Dodecylbenzene **sulfonic acid**, sodium salt
RL: PRP (Properties)
(surfactant; explanation of **dispersion** states of single-walled **carbon nanotubes** in solvents and aqueous surfactant solns. using solubility parameters)

REFERENCE COUNT: 40 THERE ARE 40 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L57 ANSWER 9 OF 17 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2005:275597 HCAPLUS
DOCUMENT NUMBER: 142:337415
TITLE: Electrically conducting packaging materials with good water resistance, their manufacture, and containers for electronic parts
INVENTOR(S): Saito, Takashi
PATENT ASSIGNEE(S): Mitsubishi Rayon Co., Ltd., Japan
SOURCE: Jpn. Kokai Tokkyo Koho, 36 pp.
CODEN: JKXXAF
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2005081766	A	20050331	JP 2003-318349	200309 10

PRIORITY APPLN. INFO.: JP 2003-318349 200309 10

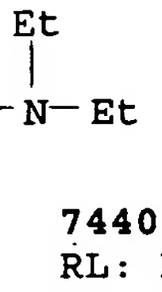
OTHER SOURCE(S): MARPAT 142:337415
AB Title materials are manufactured by applying compns. containing (A) elec. conducting **polymers**, (B) solvents, and (C) **C nanotubes** on substrates and drying to give elec. conducting layers. The containers may be trays, bags, or carrier tapes for electronic parts. Thus, an aqueous composition containing 2-aminoanisole-4-**sulfonic acid** **homopolymer** and **C nanotube** was applied

on a PET substrate and dried to give a test piece showing surface resistivity 1.9 + 102 Ω initially and 2.5 + 102 Ω after monoaxial stretching, visible light transmittance 72%, and good antiblocking property.

IT **121-44-8**, **Triethylamine**, uses
RL: MOA (Modifier or additive use); TEM (Technical or engineered material use); USES (Uses)
(elec. conducting layers; manufacture of packaging materials with good antistatic property for containers of electronic parts)

RN 121-44-8 HCAPLUS

CN Ethanamine, N,N-diethyl- (9CI) (CA INDEX NAME)



IT **7440-44-0**, **Carbon**, uses
RL: MOA (Modifier or additive use); TEM (Technical or engineered material use); USES (Uses)
(**nanotubes**, elec. conducting layers; manufacture of packaging materials with good antistatic property for containers of electronic parts)

RN 7440-44-0 HCAPLUS

CN Carbon (CA INDEX NAME)

C

IC ICM B32B027-18
ICS B65D085-86; H01B005-14

CC 38-3 (Plastics Fabrication and Uses)
Section cross-reference(s): 76

ST elec conducting packaging material **carbon nanotube** ; conducting **polymer** antistatic electronic packaging material; antistatic packaging material **carbon nanotube** transparency; water resistance packaging material **carbon nanotube**

IT **Nanotubes**
(**carbon**, elec. conducting layers; manufacture of packaging materials with good antistatic property for containers of electronic parts)

IT Acrylic **polymers**, uses
Polyesters, uses
RL: MOA (Modifier or additive use); TEM (Technical or engineered material use); USES (Uses)
(elec. conducting layers; manufacture of packaging materials with good antistatic property for containers of electronic parts)

IT Antistatic agents
Antistatic materials
Bags
Conducting **polymers**
Containers
Electronic packaging materials
Plates
Water-resistant materials
(manufacture of packaging materials with good antistatic property for containers of electronic parts)

IT 7631-86-9, **Colloidal** silica, uses
RL: MOA (Modifier or additive use); TEM (Technical or engineered material use); USES (Uses)
(**colloidal**, elec. conducting layers; manufacture of packaging materials with good antistatic property for containers of electronic parts)

IT **121-44-8**, **Triethylamine**, uses 1336-21-6, Ammonium hydroxide 2530-83-8, γ-Glycidoxypropyltrimethoxysilane 27176-87-0, Dodecylbenzenesulfonic acid 37337-82-9, Vylon 200 491828-15-0, Dianal MX 1845
RL: MOA (Modifier or additive use); TEM (Technical or engineered material use); USES (Uses)
(elec. conducting layers; manufacture of packaging materials with good antistatic property for containers of electronic parts)

IT 25233-30-1P, Polyaniline 105009-55-0P 167860-86-8P, 2-Aminoanisole-4-**sulfonic acid homopolymer**
RL: IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(elec. conductors; manufacture of packaging materials with good antistatic property for containers of electronic parts)

IT **7440-44-0**, **Carbon**, uses
RL: MOA (Modifier or additive use); TEM (Technical or engineered material use); USES (Uses)
(**nanotubes**, elec. conducting layers; manufacture of packaging materials with good antistatic property for containers of electronic parts)

L57 ANSWER 10 OF 17 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2005:255472 HCAPLUS
DOCUMENT NUMBER: 142:464431
TITLE: Preparation and properties of acid-treated multiwalled **carbon nanotube** /waterborne polyurethane **nanocomposites**
AUTHOR(S): Kwon, Ji-Yun; Kim, Han-Do
CORPORATE SOURCE: Department of Textile Engineering, Pusan National University, Pusan, 609-735, S. Korea
SOURCE: Journal of Applied Polymer Science (2005), 96(2), 595-604
CODEN: JAPNAB; ISSN: 0021-8995
PUBLISHER: John Wiley & Sons, Inc.
DOCUMENT TYPE: Journal
LANGUAGE: English

AB **Nitric acid** treated multiwalled **carbon nanotubes** (A-CNTs) were **dispersed** in a waterborne polyurethane (WBPU) matrix to obtain WBPU/A-CNT nanocomposite films (99.99/0.01-98.5/1.5) with enhanced thermal, mech., and elec. properties. By XPS, the oxygen content of the **carbon nanotube** (CNT) surface was found to increase with increasing acid treatment time. With increasing acid treatment time, the contact angle of the CNT surface was significantly decreased from 15 to 0°. The mean particle sizes of the raw CNT and A-CNT aqueous solns. were 404.2 and 17.2 nm, resp., indicating that the acid treatment led to a reduced agglomeration of CNTs. The elec. conductivity of raw CNT was 23 S/cm, and that of A-CNT significantly increased with increasing acid treatment time up to 30 min and then decreased a little. By dynamic mech. thermal anal., the storage modulus and loss tangent peak temperature (the glass-transition temperature) of the WBPU/A-CNT nanocomposites were found to increase with increasing A-CNT content. The initial tensile moduli and tensile strengths of

the nanocomposite film with 1.5% loading of A-CNT were enhanced by about 19 and 12%, resp., compared to the corresponding values for the original WBPU film. The WBPU/A-CNT1.5 nanocomposite film containing 1.5% of A-CNT exhibited a conductivity of 1.2+10-4 S/cm, which was nearly eight orders of magnitude higher that of the WBPU film (2.5+10-12 S/cm). The antistatic half-life (τ1/2) of the WBPU film was about 110 s, indicating that pure the WBPU film was a typical electrostatic material. However, those of the WBPU/A-CNT nanocomposites decreased exponentially with increasing A-CNT content. The WBPU/A-CNT1.5 sample, containing 1.5% of A-CNT and with a τ1/2 of 1 s, had good antistatic properties.

CC 37-6 (Plastics Manufacture and Processing)
Section cross-reference(s): 76

ST **carbon nanotube** waterborne polyurethane **nanocomposite** prepn

IT **Nanotubes**
(**carbon**; preparation of acid-treated multiwalled **carbon nanotube**/waterborne polyurethane **nanocomposites** and properties thereof)

IT Electric conductivity
Elongation at break
Loss modulus
Storage modulus
Stress-strain relationship
Tensile strength
Young's modulus
(of acid-treated multiwalled **carbon nanotube**/waterborne polyurethane **nanocomposites**)

IT Nanocomposites
(preparation of acid-treated multiwalled **carbon nanotube**/waterborne polyurethane **nanocomposites** and properties thereof)

IT Polyurethanes, preparation
RL: POF (Polymer in formulation); PRP (Properties); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
(preparation of acid-treated multiwalled **carbon nanotube**/waterborne polyurethane **nanocomposites** and properties thereof)

IT Complex modulus
(tan δ; of acid-treated multiwalled **carbon nanotube**/waterborne polyurethane **nanocomposites**)

IT 189750-64-9P, Dimethylolpropionic acid-ethylenediamine-isophorone diisocyanate-PTMG block **copolymer triethylamine** salt
RL: POF (Polymer in formulation); PRP (Properties); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
(preparation of acid-treated multiwalled **carbon nanotube**/waterborne polyurethane **nanocomposites** and properties thereof)

REFERENCE COUNT: 42 THERE ARE 42 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L57 ANSWER 11 OF 17 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2004:1080556 HCAPLUS
DOCUMENT NUMBER: 142:42564
TITLE: Treatment of **carbon nanostructure** using fluidization
INVENTOR(S): Jung, Kyeong Taek; Kim, Myung Soo; Jeon, Kwan

Goo; Lee, Young Hee
PATENT ASSIGNEE(S): S. Korea
SOURCE: U.S. Pat. Appl. Publ., 13 pp.
CODEN: USXXCO
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 2004253374	A1	20041216	US 2004-830914	200404 23
KR 2004091951	A	20041103	KR 2003-25733	200304 23
KR 2004093542	A	20041106	KR 2003-27453	200304 30
JP 2005001980	A	20050106	JP 2004-128506	200404 23

PRIORITY APPLN. INFO.:

KR 2003-25733	A	200304 23
KR 2003-27453	A	200304 30

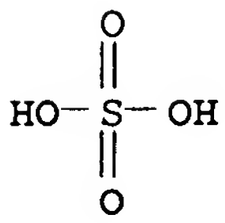
AB The present invention relates to an efficient and simple method for treating a **carbon nanostructure** by fluidizing the **carbon nanostructure** in a reactor using a carrier gas and a reactive gas to contact the fluidized **carbon nanostructure. Carbon nanostructures** can be effectively purified, uniformly surface-treated and easily employable in the post-process, e.g., in the production of a composite.

IT **7440-44-0P, Carbon**, preparation
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PYP (Physical process); SPN (Synthetic preparation); PREP (Preparation); PROC (Process)
(**nanostructure**; treatment of **carbon nanostructure** using fluidization)
RN 7440-44-0 HCAPLUS
CN Carbon (CA INDEX NAME)

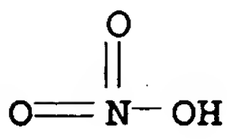
C

IT **7664-93-9, Sulfuric acid**, processes
7697-37-2, Nitric acid, processes
RL: CPS (Chemical process); MOA (Modifier or additive use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(purifying gas and surface treating agent; treatment of **carbon nanostructure** using fluidization)

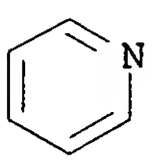
RN 7664-93-9 HCAPLUS
CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



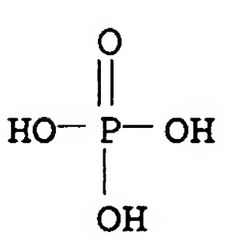
RN 7697-37-2 HCAPLUS
CN Nitric acid (8CI, 9CI) (CA INDEX NAME)



IT **110-86-1, Pyridine**, processes **7664-38-2, Phosphoric acid**, processes
RL: CPS (Chemical process); MOA (Modifier or additive use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(surface treating agent; treatment of **carbon nanostructure** using fluidization)
RN 110-86-1 HCAPLUS
CN Pyridine (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)



RN 7664-38-2 HCAPLUS
CN Phosphoric acid (7CI, 8CI, 9CI) (CA INDEX NAME)



IC ICM C23C016-26
INCL 427213000; 427249100
CC 57-8 (Ceramics)
Section cross-reference(s): 66
ST **carbon nanostructure** fluidization surface treatment composite manuf
IT Sulfonation
(agent; treatment of **carbon nanostructure** using fluidization)
IT Titanates
RL: CPS (Chemical process); MOA (Modifier or additive use); PEP (Physical, engineering or chemical process); PROC (Process); USES

(Uses)
(alkoxides, secondary surface treatment agent; treatment of **carbon nanostructure** using fluidization)

IT Silanes
RL: CPS (Chemical process); MOA (Modifier or additive use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(alkoxy, secondary surface treatment agent; treatment of **carbon nanostructure** using fluidization)

IT Metal alkoxides
RL: CPS (Chemical process); MOA (Modifier or additive use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(aluminum, secondary surface treatment agent; treatment of **carbon nanostructure** using fluidization)

IT **Nanostructures**
(**carbon**; treatment of **carbon nanostructure** using fluidization)

IT Gases
(carrier; treatment of **carbon nanostructure** using fluidization)

IT Vapor deposition process
(chemical; treatment of **carbon nanostructure** using fluidization)

IT Air
(purifying gas; treatment of **carbon nanostructure** using fluidization)

IT Composites
(reinforced; treatment of **carbon nanostructure** using fluidization)

IT Carbonates, processes
Chlorides, processes
Metal alkoxides
Nitrates, processes
Phosphines
RL: CPS (Chemical process); MOA (Modifier or additive use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(secondary surface treatment agent; treatment of **carbon nanostructure** using fluidization)

IT Metal alkoxides
RL: CPS (Chemical process); MOA (Modifier or additive use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(titanium, secondary surface treatment agent; treatment of **carbon nanostructure** using fluidization)

IT Coupling agents
Dispersion (of materials)
Etching
Fluidization
Fluidized beds
Fluorination
Heat treatment
Nitration
Oxidation
Plasma
Purification
Raman spectra
Surface treatment
X-ray photoelectron spectra

(treatment of **carbon nanostructure** using fluidization)

IT Metals, processes
RL: CPS (Chemical process); MOA (Modifier or additive use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(vaporized, secondary surface treatment agent; treatment of **carbon nanostructure** using fluidization)

IT 1333-74-0, Hydrogen, processes 7664-41-7, Ammonia, processes
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)
(etching gas; treatment of **carbon nanostructure** using fluidization)

IT 7440-37-1, Argon, uses 7440-59-7, Helium, uses 7727-37-9, Nitrogen, uses
RL: NUU (Other use, unclassified); USES (Uses)
(gas carrier; treatment of **carbon nanostructure** using fluidization)

IT **7440-44-0P, Carbon**, preparation
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PYP (Physical process); SPN (Synthetic preparation); PREP (Preparation); PROC (Process)
(**nanostructure**; treatment of **carbon nanostructure** using fluidization)

IT 124-38-9, Carbon dioxide, processes 7647-01-0, Hydrochloric acid, processes 7664-39-3, Fluorhydric acid, processes **7664-93-9**, **Sulfuric acid**, processes **7697-37-2**, **Nitric acid**, processes 7722-84-1, Hydrogen peroxide, processes
RL: CPS (Chemical process); MOA (Modifier or additive use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(purifying gas and surface treating agent; treatment of **carbon nanostructure** using fluidization)

IT 7782-44-7, Oxygen, processes
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)
(purifying gas; treatment of **carbon nanostructure** using fluidization)

IT 71-50-1, Acetate, processes
RL: CPS (Chemical process); MOA (Modifier or additive use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(secondary surface treatment agent; treatment of **carbon nanostructure** using fluidization)

IT 74-90-8, Hydrogen cyanide, processes **110-86-1**, **Pyridine**, processes 7446-09-5, Sulfur oxide, processes **7664-38-2**, **Phosphoric acid**, processes 7722-64-7, Potassium permanganate 7758-05-6, Potassium iodate 7782-50-5, Chlorine, processes 7783-06-4, Hydrogen sulfide, processes 10024-97-2, Nitrogen oxide (N2O), processes 10028-15-6, Ozone, processes 10049-04-4, Chlorine dioxide 10102-43-9, Nitrogen oxide (NO), processes 10102-44-0, Nitrogen oxide (NO2), processes 12624-32-7, Sulfur oxide
RL: CPS (Chemical process); MOA (Modifier or additive use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(surface treating agent; treatment of **carbon nanostructure** using fluidization)

IT 102-54-5, Ferrocene

RL: CAT (Catalyst use); USES (Uses)
(treatment of **carbon nanostructure** using fluidization)

IT 64-17-5, Ethanol, processes 71-43-2, Benzene, processes 78-10-4, TEOS 7782-41-4, Fluorine, processes 10026-04-7, Tetrachlorosilane
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)
(treatment of **carbon nanostructure** using fluidization)

IT 9000-11-7, Carboxymethyl cellulose 25155-30-0, Sodium dodecyl-benzene sulfonate
RL: NUU (Other use, unclassified); USES (Uses)
(treatment of **carbon nanostructure** using fluidization)

L57 ANSWER 12 OF 17 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2004:856907 HCAPLUS
DOCUMENT NUMBER: 141:356031
TITLE: Functionalized nanotubes
INVENTOR(S): Fischer, Alan; Hoch, Robert; Moy, David; Lu, Ming; Martin, Mark; Niu, Chun Ming; Ogata, Naoya; Tennent, Howard; Dong, Liwen; Sun, Ji; Helms, Larry; Jameison, Fabian; Liang, Pam; Simpson, David
PATENT ASSIGNEE(S): Hyperion Catalysis International, Inc., USA
SOURCE: U.S. Pat. Appl. Publ., 50 pp., Cont.-in-part of U.S. Ser. No. -594,673.
CODEN: USXXCO
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 5
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 2004202603	A1	20041014	US 2004-837125	20040430
US 6203814	B1	20010320	US 1994-352400	19941208
US 2006193868	A1	20060831	US 2006-412350	20060426

PRIORITY APPLN. INFO.:

US 1994-352400	A3	19941208
US 1996-611368	B1	19960306
US 1996-37238P	P	19960925
US 1997-812856	B1	19970317

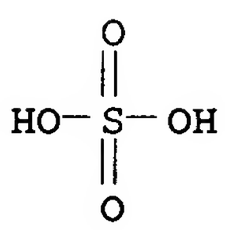
06

US 2000-594673 A2
200006
16

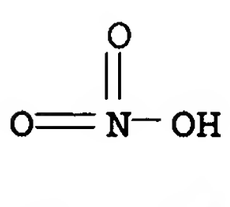
AB The invention describes graphitic nanotubes, which includes tubular fullerenes (commonly called "buckytubes") and fibrils, which are functionalized by chemical substitution or by adsorption of functional moieties. More specifically the invention relates to graphitic nanotubes which are uniformly or non-uniformly substituted with chemical moieties or upon which certain cyclic compds. are adsorbed and to complex structures comprised of such functionalized nanotubes linked to one another. The invention also relates to methods for introducing functional groups onto the surface of such nanotubes. The invention further relates to uses for functionalized nanotubes.

IT **7664-93-9DP, Sulfuric acid**, surface reaction product with **carbon nanotubes** and fibrils **7697-37-2DP, Nitric acid**, surface reaction product with **carbon nanotubes** and fibrils
RL: SPN (Synthetic preparation); PREP (Preparation)
(surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)

RN 7664-93-9 HCAPLUS
CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



RN 7697-37-2 HCAPLUS
CN Nitric acid (8CI, 9CI) (CA INDEX NAME)



IC ICM D01F009-12
ICS C07C063-333
INCL 423447200; 562492000; 564426000
CC 66-4 (Surface Chemistry and Colloids)
Section cross-reference(s): 7
ST **carbon nanotube** fibril surface functionalization; enzyme immobilization surface functionalized carbon fibril
IT Dendritic **polymers**
RL: SPN (Synthetic preparation); PREP (Preparation)
(**carbon nanotube** and fibril surface bonded; surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)
IT **Nanotubes**
(**carbon**, surface functionalized; surface functionalization of **carbon nanotubes** and

fibrils for enzyme immobilization)
IT Fibril
(carbon; surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)
IT Immobilization, molecular or cellular
(enzyme; surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)
IT Electrodes
(flow-through; surface functionalization of **carbon nanotubes** and fibrils for substance immobilization)
IT Enzymes, processes
RL: CAT (Catalyst use); PEP (Physical, engineering or chemical process); PYP (Physical process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent); USES (Uses)
(immobilized; surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)
IT Solid phase synthesis
(peptide; surface functionalization of **carbon nanotubes** and fibrils for substance immobilization)
IT Albumins, processes
RL: PEP (Physical, engineering or chemical process); PUR (Purification or recovery); PYP (Physical process); PREP (Preparation); PROC (Process)
(serum; surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)
IT Affinity chromatographic stationary phases
Functional groups
Surface reaction
(surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)
IT Avidins
RL: BUU (Biological use, unclassified); PEP (Physical, engineering or chemical process); PYP (Physical process); RCT (Reactant); BIOL (Biological study); PROC (Process); RACT (Reactant or reagent); USES (Uses)
(surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)
IT Antibodies and Immunoglobulins
RL: PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process)
(surface functionalization of **carbon nanotubes** and fibrils for protein immobilization)
IT Polyoxyalkylenes, processes
RL: PEP (Physical, engineering or chemical process); PYP (Physical process); RCT (Reactant); SPN (Synthetic preparation); PREP (Preparation); PROC (Process); RACT (Reactant or reagent)
(surface reaction product with **carbon nanotubes** and fibrils; surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)
IT Lactoglobulins
RL: PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process)
(β-; surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)
IT 7440-57-5, Gold, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(attachment of thiol **modified carbon nanotubes** to gold surfaces)
IT 5957-17-5P, Triethyl(2-hydroxyethyl)ammonium iodide
RL: RCT (Reactant); SPN (Synthetic preparation); PREP (Preparation);

RACT (Reactant or reagent)
(preparation and reaction with **carbon nanotube** and fibrils surfaces)

IT 25104-18-1DP, L-Lysine, **homopolymer**, carbon fibril bonded
RL: SPN (Synthetic preparation); PREP (Preparation)
(preparation of dendritic lysine bonded to carbon fibril surface)

IT 653-37-2, Pentafluorobenzaldehyde
RL: RCT (Reactant); RACT (Reactant or reagent)
(reaction with ethylenediamine surface bonded to surface of **carbon nanotubes** and fibrils)

IT 9013-20-1, Streptavidin
RL: BUU (Biological use, unclassified); RCT (Reactant); BIOL (Biological study); RACT (Reactant or reagent); USES (Uses)
(surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)

IT 9001-62-1, Lipase
RL: CAT (Catalyst use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
(surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)

IT 9002-07-7, Trypsin
RL: CAT (Catalyst use); PEP (Physical, engineering or chemical process); PYP (Physical process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent); USES (Uses)
(surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)

IT 9001-78-9, Alkaline phosphatase 9035-51-2, Cytochrome P450, processes
RL: PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process)
(surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)

IT 6066-82-6D, N-Hydroxysuccinimide, surface reaction product with **carbon nanotubes** and fibrils
RL: PEP (Physical, engineering or chemical process); PYP (Physical process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)
(surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)

IT 25322-68-3DP, surface reaction product with **carbon nanotubes** and fibrils
RL: PEP (Physical, engineering or chemical process); PYP (Physical process); RCT (Reactant); SPN (Synthetic preparation); PREP (Preparation); PROC (Process); RACT (Reactant or reagent)
(surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)

IT 94-36-0, Benzoyl peroxide, reactions 9003-99-0, Peroxidase
RL: RCT (Reactant); RACT (Reactant or reagent)
(surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)

IT 107-15-3DP, 1,2-Ethanediamine, surface reaction product with **carbon nanotubes** and fibrils 109-02-4DP, surface reaction product with **carbon nanotubes** and fibrils 7775-09-9DP, Sodium chlorate, surface reaction product with **carbon nanotubes** and fibrils
23586-53-0DP, Thallium(III) trifluoroacetate, surface reaction product with **carbon nanotubes** and fibrils
30189-36-7DP, Bis(tert-butoxycarbonyl)lysine-N-hydroxysuccinimide, surface reaction product with **carbon nanotubes** and fibrils 65915-94-8P, N-tert-Butoxycarbonyl-1,6-diaminohexane hydrochloride 79849-03-9DP, Nitrilotriacetic acid hydrochloride,

surface reaction product with **carbon nanotubes**
and fibrils
RL: RCT (Reactant); SPN (Synthetic preparation); PREP (Preparation);
RACT (Reactant or reagent)
(surface functionalization of **carbon nanotubes**
and fibrils for enzyme immobilization)

IT 56-87-1DP, L-Lysine, carbon fibril bonded, preparation 58-85-5DP, Biotin, surface reaction product with carbon fibrils 60-24-2DP, Monothioethylene glycol, surface reaction product with **carbon nanotubes** and fibrils 75-89-8DP, 2,2,2-Trifluoroethanol, surface reaction product with **carbon nanotubes** and fibrils 79-06-1DP, 2-Propenamide, surface reaction product with **carbon nanotubes** and fibrils 79-10-7DP, 2-Propenoic acid, surface reaction product with **carbon nanotubes** and fibrils 107-02-8DP, Propenal, surface reaction product with **carbon nanotubes** and fibrils 107-11-9DP, 3-Amino-1-propene, surface reaction product with **carbon nanotubes** and fibrils 107-13-1DP, 2-Propenenitrile, surface reaction product with **carbon nanotubes** and fibrils 107-18-6DP, 2-Propen-1-ol, surface reaction product with **carbon nanotubes** and fibrils 108-31-6DP, 2,5-Furandione, surface reaction product with **carbon nanotubes** and fibrils 109-72-8DP, Butyllithium, surface reaction product with **carbon nanotubes** and fibrils 110-16-7DP, 2-Butenedioic acid (Z)-, surface reaction product with **carbon nanotubes** and fibrils 111-86-4DP, 1-Octanamine, surface reaction product with **carbon nanotubes** and fibrils 124-30-1DP, 1-Octadecanamine, surface reaction product with **carbon nanotubes** and fibrils 151-50-8DP, Potassium cyanide, surface reaction product with **carbon nanotubes** and fibrils 530-62-1DP, N,N'-Carbonyl diimidazole, surface reaction product with **carbon nanotubes** and fibrils 593-56-6DP, Methoxyamine hydrochloride, surface reaction product with **carbon nanotubes** and fibrils 814-68-6DP, Propenoyl chloride, surface reaction product with **carbon nanotubes** and fibrils 994-30-9DP, Chlorotriethylsilane, surface reaction product with **carbon nanotubes** and fibrils 1310-73-2DP, Sodium hydroxide, surface reaction product with **carbon nanotubes** and fibrils 1333-74-0DP, Hydrogen, surface reaction product with **carbon nanotubes** and fibrils 1336-21-6DP, Ammonium hydroxide, surface reaction product with **carbon nanotubes** and fibrils 1892-57-5DP, 1-Ethyl-3-(3-dimethylaminopropyl)carbodiimide, surface reaction product with **carbon nanotubes** and fibrils 2016-57-1DP, 1-Aminodecane, surface reaction product with **carbon nanotubes** and fibrils 2074-87-5DP, Cyanogen, surface reaction product with **carbon nanotubes** and fibrils 4048-33-3DP, 6-Aminohexan-1-ol, surface reaction product with **carbon nanotubes** and fibrils 4781-83-3DP, 2-Iminothiolane hydrochloride, surface reaction product with **carbon nanotubes** and fibrils 5591-94-6DP, surface reaction product with **carbon nanotubes** and fibrils 5957-17-5DP, Triethyl(2-hydroxyethyl)ammonium iodide, surface reaction product with **carbon nanotubes** and fibrils 7664-41-7DP, Ammonia, surface reaction product with **carbon nanotubes** and fibrils **7664-93-9DP**
, **Sulfuric acid**, surface reaction product with

carbon nanotubes and fibrils **7697-37-2DP**
, **Nitric acid**, surface reaction product with
carbon nanotubes and fibrils 7704-34-9DP,
Sulfur, surface reaction product with **carbon**
nanotubes and fibrils 7732-18-5DP, Water, surface reaction
product with **carbon nanotubes** and fibrils
7782-44-7DP, Oxygen, surface reaction product with **carbon**
nanotubes and fibrils 13214-66-9DP, 4-Phenylbutylamine,
surface reaction product with **carbon nanotubes**
and fibrils 19008-71-0DP, 8-Aminooctan-1-ol, surface reaction
product with **carbon nanotubes** and fibrils
23160-46-5DP, 10-Aminodecan-1-ol, surface reaction product with
carbon nanotubes and fibrils 103708-09-4DP,
Sulfosuccinimidyl-4-(N-maleimidomethyl)cyclohexanecarboxylate,
surface reaction product with **carbon nanotubes**
and fibrils 142755-63-3DP, 18-Aminooctadecan-1-ol, surface
reaction product with **carbon nanotubes** and
fibrils
RL: SPN (Synthetic preparation); PREP (Preparation)
(surface functionalization of **carbon nanotubes**
and fibrils for enzyme immobilization)
IT 53-84-9, NAD
RL: PEP (Physical, engineering or chemical process); PYP (Physical
process); PROC (Process)
(surface functionalization of **carbon nanotubes**
and fibrils for preparation of affinity matrixes)
IT 9001-60-9P, Lactate dehydrogenase
RL: PUR (Purification or recovery); PREP (Preparation)
(surface functionalization of **carbon nanotubes**
and fibrils for preparation of affinity matrixes)
IT 20219-84-5DP, (Phthalocyaninato)bis(**pyridine**)iron, surface
reaction product with carbon fibrils
RL: NUU (Other use, unclassified); SPN (Synthetic preparation); PREP
(Preparation); USES (Uses)
(use of iron phthalocyaninato functionalized carbon fibril
surface as electrodes in flow cell)

L57 ANSWER 13 OF 17 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2004:753225 HCAPLUS
DOCUMENT NUMBER: 141:268558
TITLE: **Carbon nanotubes** surface-
modified with **polymerizable**
moieties for patterned film
INVENTOR(S): Park, Jong Jin; Shin, Jung Han; Lee, Sang Yoon
PATENT ASSIGNEE(S): Samsung Electronics Co., Ltd., S. Korea
SOURCE: Eur. Pat. Appl., 25 pp.
CODEN: EPXXDW
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
EP 1457821	A1	20040915	EP 2004-250727	20040211

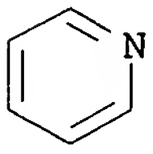
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC,
PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR, BG, CZ, EE, HU,

	SK, HR			
KR 2004076512	A	20040901	KR 2003-11898	200302 26
JP 2004255564	A	20040916	JP 2004-50632	200402 26
CN 1530404	A	20040922	CN 2004-10028338	200402 26
US 2004265755	A1	20041230	US 2004-786592	200402 26
PRIORITY APPLN. INFO.:			KR 2003-11898 A	200302 26

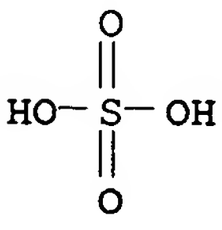
AB Disclosed herein are methods of making a neg. pattern of **carbon nanotubes** or a **polymerized carbon nanotube** composite having interpenetrating **polymer** network(IPN) by modifying the surfaces of the **carbon nanotubes** with **polymerizable** functional groups such as oxirane and anhydride groups and subjecting the surface-**modified carbon nanotubes** either to a photolithog. process or to a heat-curing process. By virtue of the present invention, desired patterns of **carbon nanotubes** can be easily made on the surfaces of various substrates, and **polymerized carbon nanotube** composites improved in hardening properties can be made without addnl. **polymers.**

IT **110-86-1, Pyridine**, uses **7664-93-9D, Sulfuric acid**, reaction product with **carbon nanotubes 7697-37-2, Nitric acid**, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(**carbon nanotubes** surface-**modified** with **polymerizable** moieties for patterned film)

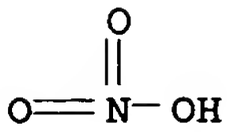
RN 110-86-1 HCAPLUS
CN Pyridine (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)



RN 7664-93-9 HCAPLUS
CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



RN 7697-37-2 HCAPLUS
CN Nitric acid (8CI, 9CI) (CA INDEX NAME)



IT **7440-44-0P**, **Carbon**, preparation
RL: PNU (Preparation, unclassified); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(**nanotubes**, Iljin CNT AP-grade, surface **modified**; **carbon nanotubes** surface-**modified** with **polymerizable** moieties for patterned film)
RN 7440-44-0 HCAPLUS
CN Carbon (CA INDEX NAME)

C

IC ICM G03F007-038
ICS C01B031-02
CC 74-5 (Radiation Chemistry, Photochemistry, and Photographic and Other Reprographic Processes)
ST **carbon nanotube** patterned film composite surface modified
IT Photolithography
Surface treatment
(**carbon nanotubes** surface-**modified** with **polymerizable** moieties for patterned film)
IT **110-86-1**, **Pyridine**, uses 556-52-5, Glycidol 610-35-5D, 4-Hydroxyphthalic acid, di-Me ester **7664-93-9D**, **Sulfuric acid**, reaction product with **carbon nanotubes 7697-37-2**, **Nitric acid**, uses 7719-09-7, Thionylchloride 9003-53-6, Polystyrene
RL: TEM (Technical or engineered material use); USES (Uses)
(**carbon nanotubes** surface-**modified** with **polymerizable** moieties for patterned film)
IT **7440-44-0P**, **Carbon**, preparation
RL: PNU (Preparation, unclassified); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(**nanotubes**, Iljin CNT AP-grade, surface **modified**; **carbon nanotubes** surface-**modified** with **polymerizable** moieties for patterned film)
REFERENCE COUNT: 5 THERE ARE 5 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

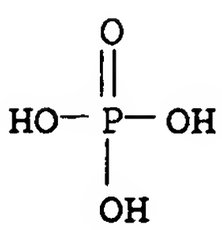
L57 ANSWER 14 OF 17 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2004:310506 HCAPLUS
DOCUMENT NUMBER: 140:322340
TITLE: Composition containing coated **nanoparticles dispersed** in heat transfer medium for enhancing thermal conductivity of heat transfer medium
INVENTOR(S): Bonsignore, Patrick V.; Gurin, Michael H.
PATENT ASSIGNEE(S): USA

SOURCE: U.S. Pat. Appl. Publ., 10 pp., Cont.-in-part of U.S. 6,432,320.
CODEN: USXXCO
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 5
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 2004069454	A1	20040415	US 2001-27387	200112 20
US 6432320	B1	20020813	US 2000-721074	200011 22
PRIORITY APPLN. INFO.:			US 1998-184137 B2	199811 02
			US 2000-721074 A2	200011 22
			US 2000-256385P P	200012 19

AB The composition for enhancing the thermal conductivity in heat transfer systems comprises a powder having average particle sizes in the nanometer to micron size range, a coating for corrosion resistance and/or acting as a **dispersant**, and a heat transfer medium selected from the group of interpolymers, **polymers**, gaseous and liquid fluids and phase change materials. The powders include metals and metal oxides, alloys or blends thereof, and carbon derivs. The surface of the powder is modified by surface complexes or phys. adsorption with a coating compound The coated powder, when mixed with a heat transfer medium, forms a **colloidal dispersion** which exhibits enhanced heat transfer capacity and thermal conductivity, stable chemical composition, faster heat transfer rates, and **dispersion** maintenance which are beneficial to most heat transfer systems.

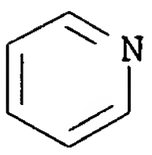
IT **7664-38-2D, Phosphoric acid**, alkyl ether derivs.
RL: TEM (Technical or engineered material use); USES (Uses)
(coating; composition containing coated **nanoparticles dispersed** in heat transfer medium for enhancing thermal conductivity of heat transfer medium)
RN 7664-38-2 HCAPLUS
CN Phosphoric acid (7CI, 8CI, 9CI) (CA INDEX NAME)



IT **7440-44-0**, Carbon, uses
RL: MOA (Modifier or additive use); USES (Uses)
(composition containing coated **nanoparticles dispersed** in heat transfer medium for enhancing thermal conductivity of heat transfer medium)
RN 7440-44-0 HCAPLUS
CN Carbon (CA INDEX NAME)

C

IT **110-86-1D**, **Pyridine**, derivs.
RL: TEM (Technical or engineered material use); USES (Uses)
(pentane-soluble; composition containing coated **nanoparticles dispersed** in heat transfer medium for enhancing thermal conductivity of heat transfer medium)
RN 110-86-1 HCAPLUS
CN Pyridine (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)



IC ICM C09K003-18
ICS C09K005-00; F28D015-00; F28D013-00; B05D007-00
INCL 165104150; 252071000; 165104160; 427212000
CC 37-6 (Plastics Manufacture and Processing)
Section cross-reference(s): 48
ST thermal cond enhancement heat transfer medium metal **nanoparticle**
IT **Polymers**, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(amorphous, heat transfer medium; composition containing coated **nanoparticles dispersed** in heat transfer medium for enhancing thermal conductivity of heat transfer medium)
IT Surfactants
(anionic, coating; composition containing coated **nanoparticles dispersed** in heat transfer medium for enhancing thermal conductivity of heat transfer medium)
IT Polyesters, uses
Polyimides, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(aromatic, heat transfer medium; composition containing coated **nanoparticles dispersed** in heat transfer medium for enhancing thermal conductivity of heat transfer medium)
IT **Nanotubes**
(**carbon**; composition containing coated **nanoparticles dispersed** in heat transfer medium for enhancing thermal conductivity of heat transfer medium)
IT Fullerenes
RL: MOA (Modifier or additive use); USES (Uses)
(carbons; composition containing coated **nanoparticles dispersed** in heat transfer medium for enhancing thermal conductivity of heat transfer medium)
IT Hydrates
RL: TEM (Technical or engineered material use); USES (Uses)

(clathrate, heat transfer medium; composition containing coated **nanoparticles dispersed** in heat transfer medium for enhancing thermal conductivity of heat transfer medium)

IT **Dispersing** agents
(coating; composition containing coated **nanoparticles dispersed** in heat transfer medium for enhancing thermal conductivity of heat transfer medium)

IT Phosphates, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(coating; composition containing coated **nanoparticles dispersed** in heat transfer medium for enhancing thermal conductivity of heat transfer medium)

IT Fatty acids, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(coco, heat transfer medium; composition containing coated **nanoparticles dispersed** in heat transfer medium for enhancing thermal conductivity of heat transfer medium)

IT Coating materials
Composites
Corrosion inhibitors
Heat transfer agents
Thermal conductivity
(composition containing coated **nanoparticles dispersed** in heat transfer medium for enhancing thermal conductivity of heat transfer medium)

IT Alloys, uses
Metals, uses
RL: MOA (Modifier or additive use); USES (Uses)
(composition containing coated **nanoparticles dispersed** in heat transfer medium for enhancing thermal conductivity of heat transfer medium)

IT **Polymers**, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(conjugated, heat transfer medium; composition containing coated **nanoparticles dispersed** in heat transfer medium for enhancing thermal conductivity of heat transfer medium)

IT Amines, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(diamines, aromatic, phenoxylated, polynuclear, heat transfer medium; composition containing coated **nanoparticles dispersed** in heat transfer medium for enhancing thermal conductivity of heat transfer medium)

IT Eutectics
Liquid crystals, **polymeric**
Phase change materials
(heat transfer medium; composition containing coated **nanoparticles dispersed** in heat transfer medium for enhancing thermal conductivity of heat transfer medium)

IT Acrylic **polymers**, uses
EPDM rubber
Epoxides
Epoxy **resins**, uses
Fatty acids, uses
Fluoropolymers, uses
Hydrocarbons, uses
Laminated plastics, uses
Monomers
Neoprene rubber, uses
Paraffin oils
Paraffin waxes, uses

Polyacetylenes, uses
Polyamides, uses
Polyamines
Polyanhydrides
Polyanilines
Polycarbonates, uses
Polyesters, uses
Polyimides, uses
Polyisocyanurates
Polyolefins
Polyoxyalkylenes, uses
Polyoxyphenylenes
Polysaccharides, uses
Polysiloxanes, uses
Polyureas
Polyurethanes, uses
Reinforced plastics
RL: TEM (Technical or engineered material use); USES (Uses)
(heat transfer medium; composition containing coated **nanoparticles dispersed** in heat transfer medium for enhancing thermal conductivity of heat transfer medium)

IT Clathrates
RL: TEM (Technical or engineered material use); USES (Uses)
(hydrates, heat transfer medium; composition containing coated **nanoparticles dispersed** in heat transfer medium for enhancing thermal conductivity of heat transfer medium)

IT Surfactants
(ionic, coating; composition containing coated **nanoparticles dispersed** in heat transfer medium for enhancing thermal conductivity of heat transfer medium)

IT Heterocyclic compounds
RL: TEM (Technical or engineered material use); USES (Uses)
(nitrogen, five-membered, coating; composition containing coated **nanoparticles dispersed** in heat transfer medium for enhancing thermal conductivity of heat transfer medium)

IT Surfactants
(nonionic, coating; composition containing coated **nanoparticles dispersed** in heat transfer medium for enhancing thermal conductivity of heat transfer medium)

IT Polyimides, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(polyamide-, heat transfer medium; composition containing coated **nanoparticles dispersed** in heat transfer medium for enhancing thermal conductivity of heat transfer medium)

IT Carboxylic acids, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(polycarboxylic, heat transfer medium; composition containing coated **nanoparticles dispersed** in heat transfer medium for enhancing thermal conductivity of heat transfer medium)

IT Polyester rubber
Polyimides, uses
Polyketones
RL: TEM (Technical or engineered material use); USES (Uses)
(polyether-, heat transfer medium; composition containing coated **nanoparticles dispersed** in heat transfer medium for enhancing thermal conductivity of heat transfer medium)

IT Alcohols, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(polyhydric, heat transfer medium; composition containing coated **nanoparticles dispersed** in heat transfer medium

for enhancing thermal conductivity of heat transfer medium)

IT Polyamides, uses
Polyethers, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(polyimide-, heat transfer medium; composition containing coated **nanoparticles dispersed** in heat transfer medium
for enhancing thermal conductivity of heat transfer medium)

IT Polyethers, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(polyketone-, heat transfer medium; composition containing coated **nanoparticles dispersed** in heat transfer medium
for enhancing thermal conductivity of heat transfer medium)

IT Vinyl compounds, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(**polymers**, heat transfer medium; composition containing coated **nanoparticles dispersed** in heat transfer medium
for enhancing thermal conductivity of heat transfer medium)

IT Monomers
RL: TEM (Technical or engineered material use); USES (Uses)
(vinyl, heat transfer medium; composition containing coated **nanoparticles dispersed** in heat transfer medium
for enhancing thermal conductivity of heat transfer medium)

IT Aluminum alloy, base
RL: MOA (Modifier or additive use); USES (Uses)
(composition containing coated **nanoparticles dispersed** in heat transfer medium for enhancing thermal conductivity of heat transfer medium)

IT 86-93-1, 1-Phenyl-5-mercaptotetrazole 95-14-7, 1H-Benzotriazole 102-71-6, Triethanolamine, uses 141-43-5, Monoethanolamine, uses 288-32-4, Imidazole, uses 288-47-1, Thiazole 288-47-1D, Thiazole, derivative 4184-79-6, 5,6-Dimethyl-benzotriazole 7347-29-7, Oleyl imidazoline **7664-38-2D**, **Phosphoric acid**, alkyl ether derivs. 8062-15-5, Lignin **sulfonic acid** 8062-15-5D, Lignin **sulfonic acid**, salts 9005-53-2D, Lignin, derivs. 9005-53-2D, Lignin, derivs. 25877-73-0 28299-33-4, Imidazoline 29385-43-1, Tolyltriazole 39650-63-0, 1H-Benzimidazole-2-pentanamine 106392-12-5, Ethylene oxide-propylene oxide block **copolymer** 234097-86-0 288296-86-6
RL: TEM (Technical or engineered material use); USES (Uses)
(coating; composition containing coated **nanoparticles dispersed** in heat transfer medium for enhancing thermal conductivity of heat transfer medium)

IT 7429-90-5, Aluminium, uses 7439-89-6, Iron, uses 7440-02-0, Nickel, uses 7440-22-4, Silver, uses 7440-32-6, Titanium, uses 7440-41-7, Beryllium, uses **7440-44-0**, Carbon, uses 7440-45-1, Cerium, uses 7440-50-8, Copper, uses 7440-57-5, Gold, uses 7782-40-3, Diamond, uses 7782-42-5, Graphite, uses 12597-69-2, Steel, uses
RL: MOA (Modifier or additive use); USES (Uses)
(composition containing coated **nanoparticles dispersed** in heat transfer medium for enhancing thermal conductivity of heat transfer medium)

IT 95-14-7D, 1H-Benzotriazole, Alkoxy derivs. 149-30-4, Mercaptobenzothiazole 24979-97-3, Poly(tetramethylene oxide) 107508-46-3
RL: TEM (Technical or engineered material use); USES (Uses)
(composition containing coated **nanoparticles dispersed** in heat transfer medium for enhancing thermal conductivity of heat transfer medium)

IT 60-35-5, Acetamide, uses 74-82-8, Methane, uses 74-98-6, Propane, uses 75-21-8, Ethylene oxide, uses 75-56-9, Propylene oxide, uses 78-94-4, Methyl vinyl ketone, uses 79-10-7D, Acrylic acid, esters, **polymers** 79-41-4D, Methacrylic acid, esters, **polymers** 80-62-6, Methyl methacrylate 88-12-0, uses 88-99-3, Phthalic acid, uses 96-33-3, Methyl acrylate 100-42-5, Styrene, uses 105-08-8, 1,4-Cyclohexanedimethanol 107-13-1, Acrylonitrile, uses 107-21-1, Ethylene glycol, uses 108-05-4, Vinyl acetate, uses 112-39-0, Methyl palmitate 112-61-8, Methyl stearate 124-04-9, Adipic acid, uses 124-09-4, 1,6-Hexanediamine, uses 143-07-7, Lauric acid, uses 286-20-4, Cyclohexene oxide 334-48-5, Capric acid 544-63-8, Myristic acid, uses 624-49-7, Methyl fumarate 629-11-8, 1,6-Hexane diol 818-61-1, 2-Hydroxyethyl acrylate 868-77-9, 2-Hydroxyethyl methacrylate 1337-81-1, Vinyl **pyridine** 1807-55-2, 4,4'-Methylenebis(N-methylaniline) 9002-86-2, Polyvinyl chloride 9002-88-4, Polyethylene 9002-88-4D, Polyethylene, chlorosulfonated 9003-07-0, Polypropylene 9003-17-2, Poly(butadiene) 9003-17-2D, Polybutadiene, hydrogenated 9003-20-7, Polyvinyl acetate 9003-31-0, Poly(isoprene) 9003-31-0D, Polyisoprene, hydrogenated 9003-39-8, Polyvinylpyrrolidone 9003-47-8, Polyvinylpyridine 9003-53-6, Polystyrene 9003-56-9, Acrylonitrile-butadiene-styrene **copolymer** 9004-35-7, Cellulose acetate 9011-14-7, **Polymethylmethacrylate** 25038-59-9, Polyethylene terephthalate, uses 25067-58-7, Polyacetylene 25190-06-1, Poly(tetramethylene oxide) 25212-74-2, Poly(phenylene sulfide) 25233-30-1, Polyaniline 25233-34-5, Polythiophene 25322-68-3, Poly(ethylene oxide) 25322-69-4, Polypropylene glycol 30604-81-0, Polypyrrole 31694-16-3
RL: TEM (Technical or engineered material use); USES (Uses)
(heat transfer medium; composition containing coated **nanoparticles dispersed** in heat transfer medium for enhancing thermal conductivity of heat transfer medium)

IT 9010-98-4
RL: TEM (Technical or engineered material use); USES (Uses)
(neoprene rubber, heat transfer medium; composition containing coated **nanoparticles dispersed** in heat transfer medium for enhancing thermal conductivity of heat transfer medium)

IT **110-86-1D, Pyridine**, derivs.
RL: TEM (Technical or engineered material use); USES (Uses)
(pentane-soluble; composition containing coated **nanoparticles dispersed** in heat transfer medium for enhancing thermal conductivity of heat transfer medium)

L57 ANSWER 15 OF 17 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2003:861313 HCAPLUS
DOCUMENT NUMBER: 140:188091
TITLE: **Modified carbon nanotubes**: an effective way to selective attachment of gold nanoparticles
AUTHOR(S): Jiang, Linqin; Gao, Lian
CORPORATE SOURCE: Shanghai Institute of Ceramics, State Key Laboratory of High Performance Ceramics and Superfine Microstructure, Chinese Academy of Sciences, Shanghai, 200050, Peop. Rep. China
SOURCE: Carbon (2003), 41(15), 2923-2929
CODEN: CRBNAH; ISSN: 0008-6223
PUBLISHER: Elsevier Science Ltd.
DOCUMENT TYPE: Journal
LANGUAGE: English

AB Through various **modifications** of **C nanotubes** (CNTs), Au **nanoparticles** were selectively attached to the nanotube and the locations of **functional** groups were further confirmed. Using cationic polyethyleneamine or anionic citric acid as the **dispersant**, the surface properties of CNTs could be changed to yield a basic or acidic surface. By electrostatic interaction, the CNTs could be successfully coated with .apprx.10 nm Au nanoparticles. After heat treatment in NH3, .apprx.1-2 nm Au nanocluster-filled nanotubes were achieved. The heat treatment with NH3 could make CNTs open-ended and generate **functional basic groups** on the inner wall of the nanotubes.

CC 66-6 (Surface Chemistry and Colloids)

ST **carbon nanotube modification** gold **nanoparticle** attachment

IT **Nanotubes**
(**carbon**; **modification** of **carbon nanotubes** by selective attachment of gold nanoparticles)

IT IR spectra
(mid-IR; of polyethyleneamine- or citric acid-coated **carbon nanotubes**)

IT **Nanoparticles**
(**modification** of **carbon nanotubes** by selective attachment of gold nanoparticles)

IT Isoelectric point
Zeta potential
(of polyethyleneamine- or citric acid-coated **carbon nanotubes**)

IT 77-92-9, Citric acid, uses 9002-98-6
RL: NUU (Other use, unclassified); USES (Uses)
(**dispersant**; **modification** of **carbon nanotubes** by selective attachment of gold nanoparticles)

IT 7440-57-5, Gold, processes
RL: PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process)
(**modification** of **carbon nanotubes** by selective attachment of gold nanoparticles)

IT 7664-41-7, Ammonia, uses
RL: NUU (Other use, unclassified); USES (Uses)
(selective attachment of gold **nanoparticles** to **carbon nanotubes** by heat treatment with NH3)

REFERENCE COUNT: 36 THERE ARE 36 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L57 ANSWER 16 OF 17 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2003:571079 HCAPLUS
DOCUMENT NUMBER: 139:135474
TITLE: Composition for enhancing thermal conductivity of a heat transfer medium and method of use thereof
INVENTOR(S): Bonsignore, Patrick V.; Gurin, Michael H.
PATENT ASSIGNEE(S): Cognitek Management Systems, Inc., USA
SOURCE: PCT Int. Appl., 31 pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 5
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2003060035	A1	20030724	WO 2001-US49758	200112 20
W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW				
RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM, AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG				
AU 2002248226	A1	20030730	AU 2002-248226	200112 20
JP 2005539094	T	20051222	JP 2003-560124	200112 20
US 2004206941	A1	20041021	US 2003-603332	200306 26
PRIORITY APPLN. INFO.:			US 2000-721074 A2	200011 22
			WO 2001-US49758 A	200112 20
			US 2002-391601P P	200206 27

AB The composition for enhancing the thermal conductivity in heat transfer systems comprises a powder having average particle sizes in the nanometer to micron size range, a coating for corrosion resistance and/or acting as a **dispersant**, and a heat transfer medium. The heat transfer medium is selected from the group of interpolymers, **polymers**, gaseous and liquid fluids and phase change materials. Suitable powders include metals and metal oxides, alloys or blends thereof, and carbon derivs. The surface of the powder is modified by surface complexes or phys. adsorption with a coating compound The coated powder, when mixed with a heat transfer medium, forms a **colloidal dispersion** which exhibits enhanced heat transfer capacity and thermal conductivity, stable chemical composition, faster heat transfer rates, and **dispersion** maintenance which are beneficial to most heat transfer systems.

IT **7440-44-0**, Carbon, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(composition for enhancing thermal conductivity of a heat transfer medium by coating a **nanoparticle dispersed** in heat transfer medium)

RN 7440-44-0 HCAPLUS
CN Carbon (CA INDEX NAME)

C

IC ICM C09K005-00
ICS C08K003-08; F28F013-00; F28D020-02
CC 48-5 (Unit Operations and Processes)
ST thermal cond enhancement heat transfer medium metal **nanoparticle**
IT Phosphates, uses
RL: MOA (Modifier or additive use); USES (Uses)
(alkyl ether; composition for enhancing thermal conductivity of a heat transfer medium by coating a **nanoparticle dispersed** in heat transfer medium)
IT Polyesters, uses
RL: MOA (Modifier or additive use); USES (Uses)
(aromatic; composition for enhancing thermal conductivity of a heat transfer medium by coating a **nanoparticle dispersed** in heat transfer medium)
IT **Nanotubes**
(**carbon**; composition for enhancing thermal conductivity of a heat transfer medium by coating a **nanoparticle dispersed** in heat transfer medium)
IT Hydrates
RL: MOA (Modifier or additive use); USES (Uses)
(clathrate; composition for enhancing thermal conductivity of a heat transfer medium by coating a **nanoparticle dispersed** in heat transfer medium)
IT Fatty acids, uses
RL: MOA (Modifier or additive use); USES (Uses)
(coco; composition for enhancing thermal conductivity of a heat transfer medium by coating a **nanoparticle dispersed** in heat transfer medium)
IT Coating materials
Composites
Corrosion prevention
Dispersing agents
Eutectics
Heat transfer agents
Laminated materials
Liquid crystals, **polymeric**
Phase change materials
Surfactants
Thermal conductivity
(composition for enhancing thermal conductivity of a heat transfer medium by coating a **nanoparticle dispersed** in heat transfer medium)
IT Acrylic **polymers**, uses
Alkali metal salts
Alkaline earth salts
Alkanes, uses
Alloys, uses
EPDM rubber
Epoxides
Epoxy **resins**, uses
Fatty acids, uses
Hydrates
Hydrocarbons, uses
Metals, uses
Neoprene rubber, uses
Paraffin waxes, uses

Polyacetylenes, uses
Polyamides, uses
Polyanhydrides
Polycarbonates, uses
Polyesters, uses
Polyimides, uses
Polyisocyanurates
Polymers, uses
Polyoxyalkylenes, uses
Polyoxyalkylenes, uses
Polyoxyphenylenes
Polysaccharides, uses
Polysiloxanes, uses
Polythiophenylenes
Polyureas
Polyurethanes, uses
Quaternary ammonium compounds, uses
Rubber, uses
Synthetic rubber, uses
RL: MOA (Modifier or additive use); USES (Uses)
(composition for enhancing thermal conductivity of a heat transfer medium by coating a **nanoparticle dispersed** in heat transfer medium)

IT Fullerenes
RL: TEM (Technical or engineered material use); USES (Uses)
(composition for enhancing thermal conductivity of a heat transfer medium by coating a **nanoparticle dispersed** in heat transfer medium)

IT Clathrates
RL: MOA (Modifier or additive use); USES (Uses)
(hydrates; composition for enhancing thermal conductivity of a heat transfer medium by coating a **nanoparticle dispersed** in heat transfer medium)

IT Heterocyclic compounds
RL: MOA (Modifier or additive use); USES (Uses)
(nitrogen, five-membered, coating; composition for enhancing thermal conductivity of a heat transfer medium by coating a **nanoparticle dispersed** in heat transfer medium)

IT Alkenes, uses
RL: MOA (Modifier or additive use); USES (Uses)
(polyalpholefins; composition for enhancing thermal conductivity of a heat transfer medium by coating a **nanoparticle dispersed** in heat transfer medium)

IT Polyimides, uses
RL: MOA (Modifier or additive use); USES (Uses)
(polyamide-; composition for enhancing thermal conductivity of a heat transfer medium by coating a **nanoparticle dispersed** in heat transfer medium)

IT Amines, uses
RL: MOA (Modifier or additive use); USES (Uses)
(polyamines, nonpolymeric; composition for enhancing thermal conductivity of a heat transfer medium by coating a **nanoparticle dispersed** in heat transfer medium)

IT Carboxylic acids, uses
RL: MOA (Modifier or additive use); USES (Uses)
(polycarboxylic; composition for enhancing thermal conductivity of a heat transfer medium by coating a **nanoparticle dispersed** in heat transfer medium)

IT Polyimides, uses
Polyketones

RL: MOA (Modifier or additive use); USES (Uses)
(polyether-; composition for enhancing thermal conductivity of a heat transfer medium by coating a **nanoparticle dispersed** in heat transfer medium)

IT Alcohols, uses
RL: MOA (Modifier or additive use); USES (Uses)
(polyhydric; composition for enhancing thermal conductivity of a heat transfer medium by coating a **nanoparticle dispersed** in heat transfer medium)

IT Polyamides, uses
Polyethers, uses
RL: MOA (Modifier or additive use); USES (Uses)
(polyimide-; composition for enhancing thermal conductivity of a heat transfer medium by coating a **nanoparticle dispersed** in heat transfer medium)

IT Polyethers, uses
RL: MOA (Modifier or additive use); USES (Uses)
(polyketone-; composition for enhancing thermal conductivity of a heat transfer medium by coating a **nanoparticle dispersed** in heat transfer medium)

IT Vinyl compounds, uses
RL: MOA (Modifier or additive use); USES (Uses)
(**polymers**; composition for enhancing thermal conductivity of a heat transfer medium by coating a **nanoparticle dispersed** in heat transfer medium)

IT Carboxylic acids, uses
RL: MOA (Modifier or additive use); USES (Uses)
(short-chain; composition for enhancing thermal conductivity of a heat transfer medium by coating a **nanoparticle dispersed** in heat transfer medium)

IT Aluminum alloy, base
Beryllium alloy, base
Copper alloy, base
Gold alloy, base
Iron alloy, base
Nickel alloy, base
Silver alloy, base
Titanium alloy, base
RL: TEM (Technical or engineered material use); USES (Uses)
(composition for enhancing thermal conductivity of a heat transfer medium by coating a **nanoparticle dispersed** in heat transfer medium)

IT 95-14-7, 1H-Benzotriazole
RL: MOA (Modifier or additive use); USES (Uses)
(coating; composition for enhancing thermal conductivity of a heat transfer medium by coating a **nanoparticle dispersed** in heat transfer medium)

IT 60-35-5, Acetamide, uses 74-82-8, Methane, uses 74-98-6, Propane, uses 75-21-8, Ethylene oxide, uses 75-56-9, Propylene oxide, uses 78-93-3, 2-Butanone, uses 78-94-4, Methyl vinyl ketone, uses 80-62-6, Methyl methacrylate 86-93-1, 1-Phenyl-5-mercaptotetrazole 88-12-0, uses 88-99-3, Phthalic acid, uses 95-14-7D, 1H-Benzotriazole, alkoxy derivs. 96-33-3, Methyl acrylate 100-42-5, Styrene, uses 102-71-6, Triethanolamine, uses 105-08-8, 1,4-Cyclohexanedimethanol 107-13-1, Acrylonitrile, uses 107-21-1, Ethylene glycol, uses 108-05-4, Vinyl acetate, uses 112-39-0, Methyl palmitate 112-61-8, Methyl stearate 124-04-9, Adipic acid, uses 124-09-4, 1,6-Hexanediamine, uses 141-43-5, Monoethanolamine, uses 143-07-7, Lauric acid, uses 149-30-4, Mercaptobenzothiazole

286-20-4, Cyclohexene oxide 288-32-4D, Imidazole, derivs. 288-47-1D, Thiazole, derivs. 334-48-5, Capric acid 504-75-6, Imidazoline 544-63-8, Myristic acid, uses 624-49-7, Methyl fumarate 629-11-8, 1,6-Hexane diol 818-61-1, 2-Hydroxyethyl acrylate 868-77-9, 2-Hydroxyethyl methacrylate 1337-81-1D, Vinyl **pyridine**, derivs. 1807-55-2, 4,4'-Methylenebis(N-methylaniline) 4184-79-6, 5,6-Dimethylbenzotriazole 7347-29-7, Oleylimidazoline 7727-73-3, Glauber's salt 8062-15-5, Lignin **sulfonic acid** 8062-15-5D, Lignin **sulfonic acid**, ammonium salts 9002-86-2, Polyvinyl chloride 9002-88-4, Polyethylene 9002-88-4D, Polyethylene, chlorosulfonated 9003-07-0, Polypropylene 9003-17-2, Poly(butadiene) 9003-17-2D, Polybutadiene, hydrogenated 9003-20-7, Polyvinyl acetate 9003-31-0, Poly(isoprene) 9003-31-0D, Poly(isoprene), hydrogenated 9003-39-8, Polyvinylpyrrolidone 9003-47-8, Polyvinylpyridine 9003-53-6, Polystyrene 9003-56-9, Acrylonitrile-butadiene-styrene **copolymer** 9004-35-7, Cellulose acetate 9005-53-2, Lignin, uses 9011-14-7, **Polymethyl** methacrylate 9041-80-9, Polyphenylene oxide 24979-97-3, Poly(tetramethylene oxide) 25038-59-9, Polyethylene terephthalate, uses 25233-30-1, Polyaniline 25233-34-5, Polythiophene 25322-68-3, Poly(ethylene oxide) 25322-69-4, Polypropylene glycol 25877-73-0 29385-43-1, Tolyltriazole 30604-81-0, Polypyrrole 39650-63-0, 2,5-(Aminopentyl)benzimidazole 106392-12-5, Ethylene oxide-propylene oxide block **copolymer** 107508-46-3 234097-86-0 288296-86-6
RL: MOA (Modifier or additive use); USES (Uses)
(composition for enhancing thermal conductivity of a heat transfer medium by coating a **nanoparticle dispersed** in heat transfer medium)

IT 7440-50-8, Copper, uses
RL: MOA (Modifier or additive use); TEM (Technical or engineered material use); USES (Uses)
(composition for enhancing thermal conductivity of a heat transfer medium by coating a **nanoparticle dispersed** in heat transfer medium)

IT 7429-90-5, Aluminum, uses 7439-89-6, Iron, uses 7440-02-0, Nickel, uses 7440-22-4, Silver, uses 7440-32-6, Titanium, uses 7440-41-7, Beryllium, uses **7440-44-0**, Carbon, uses 7440-45-1D, Cerium, compds. 7440-57-5, Gold, uses 7782-40-3, Diamond, uses 7782-42-5, Graphite, uses 12597-69-2, Steel, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(composition for enhancing thermal conductivity of a heat transfer medium by coating a **nanoparticle dispersed** in heat transfer medium)

IT 9010-98-4
RL: MOA (Modifier or additive use); USES (Uses)
(neoprene rubber, composition for enhancing thermal conductivity of a heat transfer medium by coating a **nanoparticle dispersed** in heat transfer medium)

REFERENCE COUNT: 7 THERE ARE 7 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L57 ANSWER 17 OF 17 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 1997:617963 HCAPLUS
DOCUMENT NUMBER: 127:283826
TITLE: Functionalized nanotubes
INVENTOR(S): Fischer, Alan; Hoch, Robert; Moy, David; Lu,

Ming; Martin, Mark; Niu, Chun Ming; Ogata, Naoya; Tennent, Howard; Dong, Liwen; Sun, Ji; Helms, Larry; Jameison, Fabian; Liang, Pam; Simpson, David

PATENT ASSIGNEE(S): Hyperion Catalysis International, Inc., USA

SOURCE: PCT Int. Appl., 133 pp.
CODEN: PIXXD2

DOCUMENT TYPE: Patent

LANGUAGE: English

FAMILY ACC. NUM. COUNT: 5

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 9732571	A1	19970912	WO 1997-US3553	19970305
W: AM, AT, AU, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LT, LU, LV, MD, MG, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TT, UA, US, UZ, VN, YU				
RW: GH, KE, LS, MW, SD, SZ, UG, AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG				
CA 2247820	A1	19970912	CA 1997-2247820	19970305
AU 9721979	A	19970922	AU 1997-21979	19970305
AU 724277	B2	20000914		
EP 910340	A1	19990428	EP 1997-914892	19970305
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, FI				
CN 1217653	A	19990526	CN 1997-194402	19970305
BR 9707845	A	19990727	BR 1997-7845	19970305
JP 2002503204	T	20020129	JP 1997-531955	19970305
IL 125987	A	20030212	IL 1997-125987	19970305
RU 2200562	C2	20030320	RU 1998-116596	19970305

PRIORITY APPLN. INFO.:

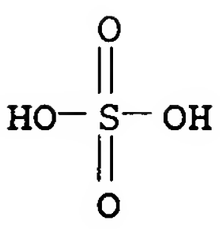
US 1996-37238	P	19960306
US 1996-37238P	P	19960306

WO 1997-US3553 W
199703
05

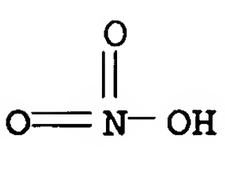
AB Graphitic nanotubes, which include tubular fullerenes (commonly called buckytubes) and fibrils, which are functionalized by chemical substitution or by adsorption of functional moieties are claimed. More specifically the invention relates to graphitic nanotubes which are uniformly or nonuniformly substituted with chemical moieties or upon which certain cyclic compds. are adsorbed and to complex structures comprised of such functionalized nanotubes linked to one another. The invention also relates to methods for introducing functional groups onto the surface of such nanotubes. The invention further relates to uses for functionalized nanotubes, which include enzyme immobilization for sample separation and immobilizing a biocatalyst capable of catalyzing a reaction on the functionalized nanotubes.

IT **7664-93-9DP, Sulfuric acid**, surface reaction product with **carbon nanotubes** and fibrils, preparation **7697-37-2DP, Nitric acid**, surface reaction product with **carbon nanotubes** and fibrils, preparation
RL: SPN (Synthetic preparation); PREP (Preparation)
(surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)

RN 7664-93-9 HCAPLUS
CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



RN 7697-37-2 HCAPLUS
CN Nitric acid (8CI, 9CI) (CA INDEX NAME)



IC ICM A61K009-00
ICS A01N025-00; C09C001-56; B32B005-16
CC 66-4 (Surface Chemistry and Colloids)
Section cross-reference(s): 7
ST **carbon nanotube** fibril surface functionalization; enzyme immobilization surface functionalized carbon fibril
IT Dendritic **polymers**
RL: SPN (Synthetic preparation); PREP (Preparation)
(**carbon nanotube** and fibril surface bonded; surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)
IT **Nanotubes**
RL: CAT (Catalyst use); PEP (Physical, engineering or chemical process); RCT (Reactant); SPN (Synthetic preparation); PREP

(Preparation); PROC (Process); RACT (Reactant or reagent); USES (Uses)
(**carbon**, surface functionalized; surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)

IT Fibril
(carbon; surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)

IT Immobilization, biochemical
(enzyme; surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)

IT Electrodes
(flow-through; surface functionalization of **carbon nanotubes** and fibrils for substance immobilization)

IT Enzymes, processes
RL: CAT (Catalyst use); PEP (Physical, engineering or chemical process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent); USES (Uses)
(immobilized; surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)

IT Solid phase synthesis
(peptide; surface functionalization of **carbon nanotubes** and fibrils for substance immobilization)

IT Albumins, processes
RL: PEP (Physical, engineering or chemical process); PUR (Purification or recovery); PREP (Preparation); PROC (Process)
(serum; surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)

IT Affinity chromatographic stationary phases
Functional groups
Surface reaction
(surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)

IT Avidins
RL: BUU (Biological use, unclassified); PEP (Physical, engineering or chemical process); RCT (Reactant); BIOL (Biological study); PROC (Process); RACT (Reactant or reagent); USES (Uses)
(surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)

IT Immunoglobulins
RL: PEP (Physical, engineering or chemical process); PROC (Process)
(surface functionalization of **carbon nanotubes** and fibrils for protein immobilization)

IT Polyoxyalkylenes, processes
RL: PEP (Physical, engineering or chemical process); RCT (Reactant); SPN (Synthetic preparation); PREP (Preparation); PROC (Process); RACT (Reactant or reagent)
(surface reaction product with **carbon nanotubes** and fibrils; surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)

IT Lactoglobulins
RL: PEP (Physical, engineering or chemical process); PROC (Process)
(β-; surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)

IT 7440-57-5, Gold, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(attachment of thiol **modified carbon nanotubes** to gold surfaces)

IT 5957-17-5P, Triethyl(2-hydroxyethyl)ammonium iodide
RL: RCT (Reactant); SPN (Synthetic preparation); PREP (Preparation);

RACT (Reactant or reagent)
(preparation and reaction with **carbon nanotube** and fibrils surfaces)

IT 25104-18-1DP, L-Lysine, **homopolymer**, carbon fibril bonded
RL: SPN (Synthetic preparation); PREP (Preparation)
(preparation of dendritic lysine bonded to carbon fibril surface)

IT 653-37-2, Pentafluorobenzaldehyde
RL: RCT (Reactant); RACT (Reactant or reagent)
(reaction with ethylenediamine surface bonded to surface of **carbon nanotubes** and fibrils)

IT 9013-20-1, Streptavidin
RL: BUU (Biological use, unclassified); RCT (Reactant); BIOL (Biological study); RACT (Reactant or reagent); USES (Uses)
(surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)

IT 9001-62-1, Lipase
RL: CAT (Catalyst use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)

IT 9002-07-7, Trypsin
RL: CAT (Catalyst use); PEP (Physical, engineering or chemical process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent); USES (Uses)
(surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)

IT 9001-78-9, Alkaline phosphatase 9035-51-2, Cytochrome P450, processes
RL: PEP (Physical, engineering or chemical process); PROC (Process)
(surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)

IT 6066-82-6D, N-Hydroxysuccinimide, surface reaction product with **carbon nanotubes** and fibrils
RL: PEP (Physical, engineering or chemical process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)
(surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)

IT 25322-68-3DP, surface reaction product with **carbon nanotubes** and fibrils
RL: PEP (Physical, engineering or chemical process); RCT (Reactant); SPN (Synthetic preparation); PREP (Preparation); PROC (Process); RACT (Reactant or reagent)
(surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)

IT 94-36-0, Benzoyl peroxide, reactions 9003-99-0, Peroxidase
RL: RCT (Reactant); RACT (Reactant or reagent)
(surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)

IT 107-15-3DP, 1,2-Ethanediamine, surface reaction product with **carbon nanotubes** and fibrils, reactions
109-02-4DP, surface reaction product with **carbon nanotubes** and fibrils 7775-09-9DP, Sodium chlorate, surface reaction product with **carbon nanotubes** and fibrils 23586-53-0DP, Thallium(III) trifluoroacetate, surface reaction product with **carbon nanotubes** and fibrils 30189-36-7DP, Bis(tert-butoxycarbonyl)lysine-N-hydroxysuccinimide, surface reaction product with **carbon nanotubes** and fibrils 65915-94-8P, N-tert-Butoxycarbonyl-1,6-diaminohexane hydrochloride 79849-03-9DP, Nitrilotriacetic acid hydrochloride, surface reaction product with **carbon**

nanotubes and fibrils
RL: RCT (Reactant); SPN (Synthetic preparation); PREP (Preparation); RACT (Reactant or reagent)
(surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)

IT 56-87-1DP, L-Lysine, carbon fibril bonded, preparation 58-85-5DP, Biotin, surface reaction product with carbon fibrils 60-24-2DP, Monothioethylene glycol, surface reaction product with **carbon nanotubes** and fibrils 75-89-8DP, 2,2,2-Trifluoroethanol, surface reaction product with **carbon nanotubes** and fibrils 79-06-1DP, 2-Propenamide, surface reaction product with **carbon nanotubes** and fibrils, preparation 79-10-7DP, 2-Propenoic acid, surface reaction product with **carbon nanotubes** and fibrils, preparation 107-02-8DP, Propenal, surface reaction product with **carbon nanotubes** and fibrils 107-11-9DP, 3-Amino-1-propene, surface reaction product with **carbon nanotubes** and fibrils 107-13-1DP, 2-Propenenitrile, surface reaction product with **carbon nanotubes** and fibrils, preparation 107-18-6DP, 2-Propen-1-ol, surface reaction product with **carbon nanotubes** and fibrils, preparation 108-31-6DP, 2,5-Furandione, surface reaction product with **carbon nanotubes** and fibrils, preparation 109-72-8DP, Butyllithium, surface reaction product with **carbon nanotubes** and fibrils 110-16-7DP, 2-Butenedioic acid (Z)-, surface reaction product with **carbon nanotubes** and fibrils 111-86-4DP, 1-Octanamine, surface reaction product with **carbon nanotubes** and fibrils 124-30-1DP, 1-Octadecanamine, surface reaction product with **carbon nanotubes** and fibrils 151-50-8DP, Potassium cyanide, surface reaction product with **carbon nanotubes** and fibrils 530-62-1DP, N,N'-Carbonyl diimidazole, surface reaction product with **carbon nanotubes** and fibrils 593-56-6DP, Methoxyamine hydrochloride, surface reaction product with **carbon nanotubes** and fibrils 814-68-6DP, Propenoyl chloride, surface reaction product with **carbon nanotubes** and fibrils 994-30-9DP, Chlorotriethylsilane, surface reaction product with **carbon nanotubes** and fibrils 1310-73-2DP, Sodium hydroxide, surface reaction product with **carbon nanotubes** and fibrils 1333-74-0DP, Hydrogen, surface reaction product with **carbon nanotubes** and fibrils, preparation 1336-21-6DP, Ammonium hydroxide, surface reaction product with **carbon nanotubes** and fibrils 1892-57-5DP, 1-Ethyl-3-(3-dimethylaminopropyl)carbodiimide, surface reaction product with **carbon nanotubes** and fibrils 2016-57-1DP, 1-Aminodecane, surface reaction product with **carbon nanotubes** and fibrils 2074-87-5DP, Cyanogen, surface reaction product with **carbon nanotubes** and fibrils 4048-33-3DP, 6-Aminohexan-1-ol, surface reaction product with **carbon nanotubes** and fibrils 4781-83-3DP, 2-Iminothiolane hydrochloride, surface reaction product with **carbon nanotubes** and fibrils 5591-94-6DP, surface reaction product with **carbon nanotubes** and fibrils 5957-17-5DP, Triethyl(2-hydroxyethyl)ammonium iodide, surface reaction product with **carbon nanotubes** and fibrils 7664-41-7DP, Ammonia, surface reaction product with **carbon nanotubes** and fibrils, preparation **7664-93-9DP, Sulfuric acid**, surface

reaction product with **carbon nanotubes** and fibrils, preparation **7697-37-2DP, Nitric acid**, surface reaction product with **carbon nanotubes** and fibrils, preparation 7704-34-9DP, Sulfur, surface reaction product with **carbon nanotubes** and fibrils, preparation 7732-18-5DP, Water, surface reaction product with **carbon nanotubes** and fibrils, preparation 7782-44-7DP, Oxygen, surface reaction product with **carbon nanotubes** and fibrils, preparation 13214-66-9DP, 4-Phenylbutylamine, surface reaction product with **carbon nanotubes** and fibrils 19008-71-0DP, 8-Aminooctan-1-ol, surface reaction product with **carbon nanotubes** and fibrils 23160-46-5DP, 10-Aminodecan-1-ol, surface reaction product with **carbon nanotubes** and fibrils 103708-09-4DP, Sulfosuccinimidyl-4-(N-maleimidomethyl)cyclohexanecarboxylate, surface reaction product with **carbon nanotubes** and fibrils 142755-63-3DP, 18-Aminooctadecan-1-ol, surface reaction product with **carbon nanotubes** and fibrils
RL: SPN (Synthetic preparation); PREP (Preparation)
(surface functionalization of **carbon nanotubes** and fibrils for enzyme immobilization)

IT 53-84-9, NAD
RL: PEP (Physical, engineering or chemical process); PROC (Process)
(surface functionalization of **carbon nanotubes** and fibrils for preparation of affinity matrixes)

IT 9001-60-9P, Lactate dehydrogenase
RL: PUR (Purification or recovery); PREP (Preparation)
(surface functionalization of **carbon nanotubes** and fibrils for preparation of affinity matrixes)

IT 20219-84-5DP, (Phthalocyaninato)bis(**pyridine**)iron, surface reaction product with carbon fibrils
RL: NUU (Other use, unclassified); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
(use of iron phthalocyaninato functionalized carbon fibril surface as electrodes in flow cell)

=>

=> d l58 ibib abs hitstr hitind 1-25

L58 ANSWER 1 OF 25 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2006:1319848 HCAPLUS
TITLE: A simple route for the attachment of **colloidal** nanocrystals to noncovalently **modified** multiwalled **carbon nanotubes**
AUTHOR(S): Olek, Maciej; Hilgendorff, Michael; Giersig, Michael
CORPORATE SOURCE: Center of Advanced European Studies and Research (CAESAR), Bonn, 53175, Germany
SOURCE: Colloids and Surfaces, A: Physicochemical and Engineering Aspects (2007), 292(1), 83-85
CODEN: CPEAEH; ISSN: 0927-7757
PUBLISHER: Elsevier B.V.
DOCUMENT TYPE: Journal
LANGUAGE: English

AB A simple strategy for the fabrication of multiwalled **carbon nanotubes** (MWNTs)-**nanocrystal** (NC) heterostructures is shown. Different nanoparticles can be covalently coupled to **functionalized carbon nanotubes** (CNTs) in a uniform and controllable manner. MWNTs have been **functionalized** by a polymer wrapping-technique that is non-invasive, and does not introduce defects to the structure of CNTs; the polymer is noncovalently adsorbed on the MWNT's surface. Moreover, this method ensures good **dispersion** and high stability in any commonly used organic or inorg. **solvent.** In this manner, our strategy allows the attachment of various **colloidal** nanoparticles to CNTs, independent of their surface properties, i.e. hydrophilic or hydrophobic.

CC 66 (Surface Chemistry and Colloids)
REFERENCE COUNT: 26 THERE ARE 26 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

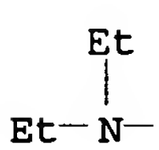
L58 ANSWER 2 OF 25 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2006:977196 HCAPLUS
DOCUMENT NUMBER: 145:346612
TITLE: Nonvolatile nanochannel memory device using organic-inorganic complex mesoporous material
INVENTOR(S): Lee, Kwang Hee; Joo, Won Jae; Yim, Jin Heong; Kang, Yoon Sok
PATENT ASSIGNEE(S): Samsung Electronics Co., Ltd., S. Korea
SOURCE: U.S. Pat. Appl. Publ., 18pp.
CODEN: USXXCO
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 2006208248	A1	20060921	US 2005-249395	200510 14
KR 2006100581	A	20060921	KR 2005-22220	200503

CN 1855501	A	20061101	CN 2006-10005080	17 200601 17
JP 2006261677	A	20060928	JP 2006-73823	200603 17
PRIORITY APPLN. INFO.:			KR 2005-22220	A 200503 17

AB A memory device of the current invention includes a memory layer having nanochannels sandwiched between an upper electrode and a lower electrode, in which the memory layer is made of an organic-inorg. complex for use in formation of nanopores, and has metal **nanoparticles** or metal ions fed into the nanopores. Therefore, the memory device has excellent processability, high reproducibility, and uniform performance.

IT **121-44-8, Triethylamine**, processes
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(in preparation of inorg.-organic hybrid mesoporous material)
RN 121-44-8 HCAPLUS
CN Ethanamine, N,N-diethyl- (9CI) (CA INDEX NAME)



IT **7440-44-0**, Carbon, processes
RL: PEP (Physical, engineering or chemical process); PYP (Physical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(nonvolatile nanochannel memory device using organic-inorg. complex mesoporous material)
RN 7440-44-0 HCAPLUS
CN Carbon (CA INDEX NAME)

C

INCL 257003000; 438780000; 257632000; 438900000
CC 76-3 (Electric Phenomena)
Section cross-reference(s): 66
IT **Polymerization**
(hydrolytic; nonvolatile nanochannel memory device using organic-inorg. complex mesoporous material)
IT **Nanoparticles**
(metals, in nanopores; nonvolatile nanochannel memory device using organic-inorg. complex mesoporous material)
IT **Nanostructures**
(nanopores; nonvolatile nanochannel memory device using organic-inorg. complex mesoporous material)
IT Conducting **polymers**
Controlled atmospheres
Diffusion barrier

Electric contacts
Evaporation
Heat treatment
Memory devices
Nonvolatile memory devices
Porogens
Screen printing
Solvents
(nonvolatile nanochannel memory device using organic-inorg. complex mesoporous material)

IT Alloys, processes
Dendritic **polymers**
Polycarbonates, processes
Polyimides, processes
Polymers, processes
Polyoxyalkylenes, processes
Silsesquioxanes
Transition metal nitrides
Transition metal oxides
Transition metal sulfides
RL: PEP (Physical, engineering or chemical process); PYP (Physical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(nonvolatile nanochannel memory device using organic-inorg. complex mesoporous material)

IT 1185-55-3DP, Methyltrimethoxysilane, **polymer** with tetramethylcyclotetrasiloxane derivative 4668-00-2DP, Chlorotrimethoxysilane, reaction product with tetramethylcyclotetrasiloxane, **polymer** with methyltrimethoxysilane 9004-73-3DP, Poly[oxy(methylsilylene)], reaction product with chlorotrimethoxysilane, **polymer** with methyltrimethoxysilane 27576-78-9DP, reaction product with chlorotrimethoxysilane, **polymer** with methyltrimethoxysilane 55216-11-0P, Heptakis(2,3,6-tri-O-methyl)-β-cyclodextrin
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PYP (Physical process); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); PROC (Process); USES (Uses)
(in preparation of inorg.-organic hybrid mesoporous material)

IT **121-44-8**, **Triethylamine**, processes 1185-55-3, Methyltrimethoxysilane 2370-88-9 4668-00-2, Chlorotrimethoxysilane
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(in preparation of inorg.-organic hybrid mesoporous material)

IT 74-86-2, Acetylene, processes 2085-33-8, Alq3 7429-90-5, Aluminum, processes **7440-44-0**, Carbon, processes 7440-57-5, Gold, processes 7631-86-9, Silica, processes 9003-01-4, Polyacrylic acid 9003-47-8, Polyvinylpyridine 9003-53-6, Polystyrene 9011-14-7, PMMA 9016-00-6, Poly(dimethylsiloxane) 12619-70-4, Cyclodextrin 25233-34-5, Thiophene **polymer** 25322-68-3, Polyethylene oxide 31900-57-9, Poly(dimethylsiloxane) 50851-57-5, Polystyrene **sulfonic acid** 65181-78-4, TPD 691397-13-4 895578-83-3
RL: PEP (Physical, engineering or chemical process); PYP (Physical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)

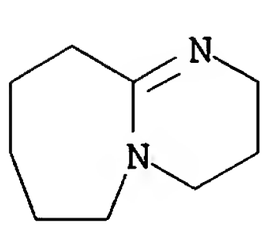
(nonvolatile nanochannel memory device using organic-inorg. complex mesoporous material)

L58 ANSWER 3 OF 25 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2006:491757 HCAPLUS
DOCUMENT NUMBER: 145:170569
TITLE: Immobilization of TiO2 **nanoparticles** on **carbon** nanocapsules for photovoltaic applications
AUTHOR(S): Huang, Hui-Chi; Huang, Gan-Lin; Chen, Hsin-Lung; Lee, Yu-Der
CORPORATE SOURCE: Department of Chemical Engineering, National Tsing Hua University, Hsinchu, 300, Taiwan
SOURCE: Thin Solid Films (2006), 511-512, 203-207
CODEN: THSFAP; ISSN: 0040-6090
PUBLISHER: Elsevier B.V.
DOCUMENT TYPE: Journal
LANGUAGE: English

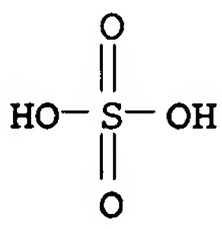
AB TiO2 **nanoparticles** were immobilized on **C** nanocapsules (CNC) treated with **H2SO4**/KMnO4, by a sol-gel process. The TEM images of the TiO2-coated CNC suggested that introducing crystallog. defects by acid functional groups tended to facilitate TiO2 immobilization onto the nanocapsules. The TiO2-coated CNCs exhibited effective quenching from a light-emitting conjugated **polymer**, poly(2-phenyl-3-phenyl-4-(3',7'-dimethyloctyloxy)-1,4-phenylene vinylene) (DPO-PPV). Consequently, the composites of the TiO2-coated CNC and conjugated semiconducting **polymers** have potential for photovoltaic applications.

IT **6674-22-2**, 1,8-Diazabicyclo[5,4,0]undec-7-ene
7664-93-9, **Sulfuric acid**, processes
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)
(carbon nanocapsule treated with; immobilization of TiO2 **nanoparticles** on functionalized **carbon** nanocapsules for solar cells)

RN 6674-22-2 HCAPLUS
CN Pyrimido[1,2-a]azepine, 2,3,4,6,7,8,9,10-octahydro- (8CI, 9CI) (CA INDEX NAME)



RN 7664-93-9 HCAPLUS
CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



IT **7440-44-0**, Carbon, uses
RL: DEV (Device component use); USES (Uses)

(immobilization of TiO2 **nanoparticles** on functionalized **carbon** nanocapsules for solar cells)
RN 7440-44-0 HCAPLUS
CN Carbon (CA INDEX NAME)

C

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST titanium oxide **nanoparticle** immobilization **carbon** nanocapsule photovoltaics
IT **Nanotubes**
(**carbon**; immobilization of TiO2 **nanoparticles** on functionalized **carbon** nanocapsules for solar cells)
IT **Nanoparticles**
(immobilization of TiO2 **nanoparticles** on functionalized **carbon** nanocapsules for solar cells)
IT 685-87-0, Diethyl bromomalonate **6674-22-2**, 1,8-Diazabicyclo[5,4,0]undec-7-ene **7664-93-9**, **Sulfuric acid**, processes 7722-64-7, Potassium permanganate
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)
(carbon nanocapsule treated with; immobilization of TiO2 **nanoparticles** on functionalized **carbon** nanocapsules for solar cells)
IT 901118-13-6
RL: PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(composite with immobilized TiO2 **nanoparticles** on functionalized **carbon** nanocapsules for solar cells)
IT **7440-44-0**, Carbon, uses 13463-67-7, Titanium oxide (TiO2), uses
RL: DEV (Device component use); USES (Uses)
(immobilization of TiO2 **nanoparticles** on functionalized **carbon** nanocapsules for solar cells)
REFERENCE COUNT: 22 THERE ARE 22 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L58 ANSWER 4 OF 25 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2005:1245405 HCAPLUS
DOCUMENT NUMBER: 145:191354
TITLE: Centrifugal purification of chemically **modified** single-walled **carbon nanotubes**
AUTHOR(S): Jia, Hongbing; Lian, Yongfu; Ishitsuka, Midori O.; Nakahodo, Tsukasa; Maeda, Yutaka; Tsuchiya, Takahiro; Wakahara, Takatsugu; Akasaka, Takeshi
CORPORATE SOURCE: Center for Tsukuba Advanced Research Alliance (TARA Center), University of Tsukuba, Tsukuba, Ibaraki, 305-8577, Japan
SOURCE: Science and Technology of Advanced Materials (2005), 6(6), 571-581
CODEN: STAMCV; ISSN: 1468-6996
PUBLISHER: Elsevier Ltd.
DOCUMENT TYPE: Journal
LANGUAGE: English
AB A wet chemical procedure which couples chemical **functionalization**

and a **dispersion**-centrifugation cycle was applied to the dissoln. and purification of as-prepared elec.-arc produced single-walled **carbon nanotubes** (SWNTs). It is validated that K2S2O8 treatment generates hydrophilic groups such as carboxyl and hydroxyl on the surfaces of varying carbons, whereas such treatment also causes no severe destruction on the structure of SWNTs. Amidation of the K2S2O8-treated and mixed acids shortened SWNTs leads them largely soluble in THF or other organic **solvents.** The soluble sample was fractionated via a **dispersion** -centrifugation cycle and highly pure and well-separated SWNTs were successfully obtained in the middle fractions. The purity of the centrifugally fractionated samples is qual. estimated with Raman spectroscopy, scanning electron microscope (SEM), and atomic force microscopy (AFM). Quant. optical absorption spectroscopy and thermogravimetric anal. show that about 60% **nanotubes** in the starting material are transferred into liquid phase and the carbonaceous purity reaches as high as 129% of a reference sample R2, an 'impurity-free' fragment of soot directly from the arc chamber.

IT **7440-44-0P, Carbon**, preparation
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PUR (Purification or recovery); PREP (Preparation); PROC (Process)
(**nanotubes**; centrifugal purification of chemical **modified** single-walled **carbon nanotubes**)
RN 7440-44-0 HCAPLUS
CN Carbon (CA INDEX NAME)

C

CC 49-1 (Industrial Inorganic Chemicals)
ST **carbon nanotube** purifn **dispersion** centrifugation
IT **Nanotubes**
(**carbon**; centrifugal purification of chemical **modified** single-walled **carbon nanotubes**)
IT Centrifugation
Dispersion (of materials)
(centrifugal purification of chemical **modified** single-walled **carbon nanotubes**)
IT 7727-21-1
RL: MOA (Modifier or additive use); USES (Uses)
(centrifugal purification of chemical **modified** single-walled **carbon nanotubes**)
IT **7440-44-0P, Carbon**, preparation
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PUR (Purification or recovery); PREP (Preparation); PROC (Process)
(**nanotubes**; centrifugal purification of chemical **modified** single-walled **carbon nanotubes**)
REFERENCE COUNT: 31 THERE ARE 31 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L58 ANSWER 5 OF 25 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2005:1172208 HCAPLUS
DOCUMENT NUMBER: 144:89058

TITLE: Soluble Nylon-**Functionalized** **Carbon Nanotubes** from Anionic Ring-Opening Polymerization from Nanotube Surface

AUTHOR(S): Qu, Liangwei; Veca, L. Monica; Lin, Yi; Kitaygorodskiy, Alex; Chen, Bailin; McCall, Alecia M.; Connell, John W.; Sun, Ya-Ping

CORPORATE SOURCE: Department of Chemistry and Laboratory for Emerging Materials and Technology, Clemson University, Clemson, SC, 29634-0973, USA

SOURCE: Macromolecules (2005), 38(24), 10328-10331
CODEN: MAMOBX; ISSN: 0024-9297

PUBLISHER: American Chemical Society

DOCUMENT TYPE: Journal

LANGUAGE: English

AB The **functionalization** of SWNTs with nylon-6 was accomplished by using the grafting- from strategy in a two-step process, where the covalent attachment of ε-caprolactam mols. to nanotubes was followed by the anionic ring-opening polymerization of these bound ε-caprolactam species with the same monomers in bulk. The resulting sample was characterized systematically, and the results were supportive of the expected covalent **functionalization** of SWNTs by nylon-6. This is a relatively convenient but still reasonably controllable method to chemical **modify carbon nanotubes** with a commodity polymer of extremely wide uses. The solubility of the **functionalized** nanotube sample in some organic **solvents** may prove valuable to the homogeneous **dispersion** of SWNTs in nylon for high-quality nanocomposite materials.

CC 37-6 (Plastics Manufacture and Processing)
Section cross-reference(s): 38

ST polycaprolactam **functionalized** single walled **carbon nanotube** ring opening polymn

IT Polymerization
(anionic, ring-opening; soluble nylon-**functionalized** **carbon nanotubes** from anionic ring-opening polymerization from nanotube surface)

IT **Nanotubes**
(**carbon**, caprolactam or poly(caprolactam) **functionalized**; soluble nylon-**functionalized** **carbon nanotubes** from anionic ring-opening polymerization from nanotube surface)

IT Polymer morphology
(soluble nylon-**functionalized carbon** **nanotubes** from anionic ring-opening polymerization from nanotube surface)

IT Polyamides, preparation
RL: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation)
(soluble nylon-**functionalized carbon** **nanotubes** from anionic ring-opening polymerization from nanotube surface)

IT 105-60-2DP, ε-Caprolactam, reaction products with **carbon nanotubes**
RL: PRP (Properties); RCT (Reactant); SPN (Synthetic preparation); PREP (Preparation); RACT (Reactant or reagent)
(soluble nylon-**functionalized carbon** **nanotubes** from anionic ring-opening polymerization from nanotube surface)

IT 25038-54-4DP, Poly(ε-caprolactam), reaction products with

carbon nanotubes
RL: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation)
(soluble nylon-**functionalized carbon nanotubes** from anionic ring-opening polymerization from nanotube surface)
REFERENCE COUNT: 34 THERE ARE 34 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L58 ANSWER 6 OF 25 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2005:1102675 HCAPLUS
DOCUMENT NUMBER: 143:388665
TITLE: **Carbon nanotube** containing coating compositions with good storage stability and appearance
INVENTOR(S): Saito, Takashi; Makabe, Toru; Shimizu, Ryushi
PATENT ASSIGNEE(S): Mitsubishi Rayon Co., Ltd., Japan
SOURCE: Jpn. Kokai Tokkyo Koho, 30 pp.
CODEN: JKXXAF
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2005281672	A	20051013	JP 2004-369130	20041221
PRIORITY APPLN. INFO.:			JP 2004-56201 A	20040301

OTHER SOURCE(S): MARPAT 143:388665
AB Title compns. comprise (A) ammonium (R1R2R3R4N+) sulfonates and/or ammonium (R1R2R3R4N+) carboxylates-containing conducting **polymers**, (B) solvents, and (C) **carbon nanotubes**, wherein R1, R2, R3, R4 = H, C1-24 alkyl, aryl, aralkyl, Ph, benzyl, R5OH, CONH2, or NH2 (≥1 of R1, R2, R3, R4 = C≥5 group); and R5 = C1-24 alkylene, arylene, or aralkylene.. Thus, 100 mmol 2-aminoanisole-4-**sulfonic acid** was **polymerized** in the presence of **triethylamine** and ammonium peroxodisulfate at 25° for 12 h to give a conducting **polymer** with volume elec. resistance 9.0 Ω-cm, 1 parts of which was mixed with 0.4 parts multiwall **carbon nanotube** and 100 parts dimethylacetamide, applied on a glass plate, and dried at 150° for 5 h to give a test piece, showing good coating appearance, surface elec. resistance 1.4 + 104 Ω-cm, and good storage stability (coating composition).
IT **7440-44-0, Carbon**, uses
RL: MOA (Modifier or additive use); USES (Uses)
(**nanotubes; carbon nanotube** containing coating compns. with good storage stability and appearance)
RN 7440-44-0 HCAPLUS
CN Carbon (CA INDEX NAME)

C

IC ICM C08L101-12
ICS C01B031-02; C04B035-52; C08J007-04; C08K003-04; C08K013-02; G01N027-04; H01B001-04; H01B001-20; H01B001-24; H01B005-14; H01B013-00

CC 42-10 (Coatings, Inks, and Related Products)
Section cross-reference(s): 38, 76

ST **carbon nanotube** contg coating compn storage stability appearance; aminoanisolesulfonic acid **homopolymer** **carbon nanotube** coating compn

IT Quaternary ammonium compounds, reactions
RL: RGT (Reagent); RACT (Reactant or reagent)
(alkylbenzyldimethyl, chlorides, alkylating agents; **carbon nanotube** containing coating compns. with good storage stability and appearance)

IT Binders
Composites
Conducting **polymers**
Electric conductors
(**carbon nanotube** containing coating compns. with good storage stability and appearance)

IT **Nanotubes**
(**carbon**; **carbon nanotube** containing coating compns. with good storage stability and appearance)

IT Coating materials
Films
(elec. conductive; **carbon nanotube** containing coating compns. with good storage stability and appearance)

IT Electric conductors
(films; **carbon nanotube** containing coating compns. with good storage stability and appearance)

IT 9011-14-7, **Polymethyl** methacrylate
RL: POF (Polymer in formulation); TEM (Technical or engineered material use); USES (Uses)
(binder; **carbon nanotube** containing coating compns. with good storage stability and appearance)

IT 105009-55-0DP, sulfonated 500101-45-1DP, alkyl ammonium derivs. 866639-54-5DP, alkyl ammonium derivs. 866639-58-9DP, sulfonated
RL: IMF (Industrial manufacture); POF (Polymer in formulation); PRP (Properties); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(**carbon nanotube** containing coating compns. with good storage stability and appearance)

IT 30348-99-3D, Acrylonitrile-acrylamide-methacrylic acid **copolymer**, carbonized
RL: POF (Polymer in formulation); PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(**carbon nanotube** containing coating compns. with good storage stability and appearance)

IT 30348-99-3, Acrylonitrile-acrylamide-methacrylic acid **copolymer**
RL: POF (Polymer in formulation); PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(film; **carbon nanotube** containing coating compns. with good storage stability and appearance)

IT **7440-44-0**, **Carbon**, uses
RL: MOA (Modifier or additive use); USES (Uses)
(**nanotubes**; **carbon nanotube** containing

coating compns. with good storage stability and appearance)

IT 866639-54-5P
RL: IMF (Industrial manufacture); POF (Polymer in formulation); PRP (Properties); RCT (Reactant); TEM (Technical or engineered material use); PREP (Preparation); RACT (Reactant or reagent); USES (Uses)
(optionally intermediate; **carbon nanotube** containing coating compns. with good storage stability and appearance)

IT 500101-45-1P
RL: IMF (Industrial manufacture); POF (Polymer in formulation); PRP (Properties); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(optionally intermediate; **carbon nanotube** containing coating compns. with good storage stability and appearance)

L58 ANSWER 7 OF 25 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2005:1050357 HCAPLUS
DOCUMENT NUMBER: 143:358472
TITLE: Electron beam generator device and method for producing the same
INVENTOR(S): Anazawa, Kazunori; Manabe, Chikara; Kishi, Kentaro; Shigematsu, Taishi; Watanabe, Miho; Hirakata, Masaki; Isozaki, Takashi; Watanabe, Hiroyuki; Ooma, Shigeki; Okada, Shinsuke
PATENT ASSIGNEE(S): Fuji Xerox Co., Ltd., Japan
SOURCE: U.S. Pat. Appl. Publ., 30 pp.
CODEN: USXXCO
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 2005212395	A1	20050929	US 2004-933296	20040903
JP 2005276498	A	20051006	JP 2004-84946	20040323

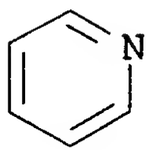
PRIORITY APPLN. INFO.: JP 2004-84946 A 20040323

AB An electron beam generator device includes a base body having a conductive surface and a electron-emission electrode having a **C nanotube** structure on the conductive surface of the substrate. The **C nanotube** structure constitutes a network structure which has plural **C nanotubes** and a crosslinked part including a chemical bond of plural functional groups. The chemical bond connects one end of one of the **C nanotubes** to another one of the **C nanotubes**. A method for producing an electron beam generator device, includes applying plural **C nanotubes** each having a functional group onto a conductive surface of a base body, and crosslinking the functional groups with a chemical bond to form a crosslinked part, thereby forming a **C nanotube** structure constituting a network structure having

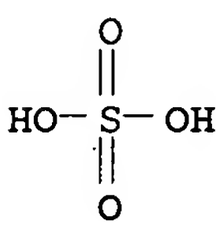
plural **C nanotubes** elec. connected to each other. This generator is highly productive and produces high-d. beams and is easy to fabricate.

IT **110-86-1, Pyridine**, processes **7664-93-9, Sulfuric acid**, processes **7697-37-2, Nitric acid**, processes
RL: CPS (Chemical process); NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(electron beam generator device and method for producing from **carbon nanotubes**)

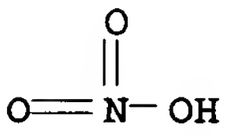
RN 110-86-1 HCAPLUS
CN Pyridine (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)



RN 7664-93-9 HCAPLUS
CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



RN 7697-37-2 HCAPLUS
CN Nitric acid (8CI, 9CI) (CA INDEX NAME)



IT **7440-44-0, Carbon**, processes
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PYP (Physical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(**nanotubes**; electron beam generator device and method for producing from **carbon nanotubes**)

RN 7440-44-0 HCAPLUS
CN Carbon (CA INDEX NAME)

C

IC ICM H01J001-02
ICS H01J001-304
INCL 313311000
CC 76-12 (Electric Phenomena)
Section cross-reference(s): 48, 66
ST **carbon nanotube** electron generator fabrication

IT Polyketones
RL: CPS (Chemical process); NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(aliphatic; electron beam generator device and method for producing from **carbon nanotubes**)

IT **Nanotubes**
(**carbon**; electron beam generator device and method for producing from **carbon nanotubes**)

IT Dehydration reaction
(condensation; electron beam generator device and method for producing from **carbon nanotubes**)

IT Condensation reaction
(dehydration; electron beam generator device and method for producing from **carbon nanotubes**)

IT Acyl groups
Addition reaction
Amide group
Amino group
Carbonyl group
Cathodes
Crosslinking
Crosslinking agents
Crosslinking catalysts
Electron sources
Esterification
Functional groups
Hydroxyl group
Oxidation
Oxidation catalysts
Polymerization
Precipitation (chemical)
Solvents
Substitution reaction
Sulfhydryl group
(electron beam generator device and method for producing from **carbon nanotubes**)

IT Carboxylic acids, processes
Polyamines
Polycarbodiimides
Polyesters, processes
RL: CPS (Chemical process); NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(electron beam generator device and method for producing from **carbon nanotubes**)

IT Carboxylic acids, processes
RL: CPS (Chemical process); NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(polycarboxylic, halides; electron beam generator device and method for producing from **carbon nanotubes**)

IT Carboxylic acids, processes
RL: CPS (Chemical process); NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(polycarboxylic; electron beam generator device and method for producing from **carbon nanotubes**)

IT Alcohols, processes
RL: CPS (Chemical process); NUU (Other use, unclassified); PEP

(Physical, engineering or chemical process); PROC (Process); USES (Uses)
(polyhydric; electron beam generator device and method for producing from **carbon nanotubes**)

IT 7553-56-2, Iodine, uses
RL: CAT (Catalyst use); USES (Uses)
(electron beam generator device and method for producing from **carbon nanotubes**)

IT 56-81-5, Glycerin, processes 67-56-1, Methanol, processes 75-13-8D, Isocyanic acid, esters, **polymers** 107-21-1, Ethylene glycol, processes **110-86-1, Pyridine**, processes 123-31-9, Hydroquinone, processes 141-52-6, Sodium ethoxide 538-75-0, Dicyclohexylcarbodiimide 1310-58-3, Potassium hydroxide, processes 1310-73-2, Sodium hydroxide, processes **7664-93-9, Sulfuric acid**, processes **7697-37-2, Nitric acid**, processes 11069-51-5, Hexynediol 12542-32-4, Butenediol 28346-70-5, Naphthalenediol 35271-22-8, N-Ethyl-N'-(3-(methylamino)propyl)carbodiimide
RL: CPS (Chemical process); NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(electron beam generator device and method for producing from **carbon nanotubes**)

IT 7439-98-7, Molybdenum, processes 7440-21-3, Silicon, processes 7440-25-7, Tantalum, processes 7440-33-7, Tungsten, processes 7782-40-3, Diamond, processes 12008-21-8, Lanthanum boride (LaB6) 12069-85-1, Hafnium carbide (HfC) 12070-06-3, Tantalum carbide (TaC) 12070-08-5, Titanium carbide (TiC) 12070-14-3, Zirconium carbide (ZrC) 25617-97-4, Gallium nitride (GaN)
RL: PEP (Physical, engineering or chemical process); PYP (Physical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(electron beam generator device and method for producing from **carbon nanotubes**)

IT **7440-44-0, Carbon**, processes
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PYP (Physical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(**nanotubes**; electron beam generator device and method for producing from **carbon nanotubes**)

L58 ANSWER 8 OF 25 HCAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 2005:954953 HCAPLUS
DOCUMENT NUMBER: 143:387821
TITLE: Comparison of the properties of waterborne polyurethane/multi walled **carbon nanotube** and acid-treated multi walled **carbon nanotube** composites prepared by in situ **polymerization**
AUTHOR(S): Kwon, Jiyun; Kim, Hando
CORPORATE SOURCE: Department of Textile Engineering, Pusan National University, Pusan, 609-735, S. Korea
SOURCE: Journal of Polymer Science, Part A: Polymer Chemistry (2005), 43(17), 3973-3985
CODEN: JPACEC; ISSN: 0887-624X
PUBLISHER: John Wiley & Sons, Inc.
DOCUMENT TYPE: Journal
LANGUAGE: English

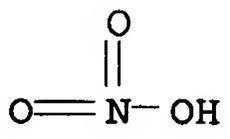
AB A series of waterborne polyurethane (WBPU)/multi walled

carbon nanotube (CNT) and WBPU/**nitric acid** treated multi walled **carbon nanotube** (A-CNT) composites were prepared by in situ **polymerization** in an aqueous medium. The optimum **nitric acid** treatment time was about 0.5 h. The effects of the CNT and A-CNT contents on the dynamic mech. thermal properties, mech. properties, hardness, elec. conductivity, and antistatic properties of the two kinds of composites were compared. The tensile strength and modulus, the glass-transition temps. of the soft and hard segments (Tgs and Tgh, resp.), and ΔTg (Tgh - Tgs) of WBPU for both composites increased with increasing CNT and A-CNT contents. However, these properties of the WBPU/A-CNT composites were higher than those of the WBPU/CNT composites with the same CNT content. The elec. conductivities of the WBPU/CNT1.5 and WBPU/A-CNT1.5 composites containing 1.5 wt % CNTs (8.0 + 10-4 and 1.1 + 10-3 S/cm) were nearly 8 and 9 orders of magnitude higher than that of WBPU (2.5 + 10-12 S/cm), resp. The half-life of the electrostatic charge (τ1/2) values of the WBPU/CNT0.1 and WBPU/A-CNT0.1 composites containing 0.1 wt % CNTs were below 10 s, and the composites had good antistatic properties. From these results, A-CNT was found to be a better reinforcer than CNT. These results suggest that WBPU/A-CNT composites prepared by in situ **polymerization** have high potential as new materials for waterborne coatings with good phys., antistatic, and conductive properties.

IT **7440-44-0, Carbon**, uses
RL: MOA (Modifier or additive use); USES (Uses)
(**nanotubes**; waterborne polyurethane/acid-treated multi walled **carbon nanotube** composite)
RN 7440-44-0 HCAPLUS
CN Carbon (CA INDEX NAME)

C

IT **7697-37-2, Nitric acid**, uses
RL: NUU (Other use, unclassified); USES (Uses)
(waterborne polyurethane/acid-treated multi walled **carbon nanotube** composite)
RN 7697-37-2 HCAPLUS
CN Nitric acid (8CI, 9CI) (CA INDEX NAME)



CC 37-6 (Plastics Manufacture and Processing)
Section cross-reference(s): 35, 42, 76
ST waterborne polyurethane in situ coating **carbon nanotube** acid treatment; antistatic coating morphol elec cond elastic modulus stress strain
IT Coating materials
(antistatic; waterborne polyurethane/acid-treated multi walled **carbon nanotube** composite)
IT Reinforced plastics
RL: PRP (Properties)
(carbon fiber-reinforced; waterborne polyurethane/acid-treated multi walled **carbon nanotube** composite)

IT **Nanotubes**
(**carbon**; waterborne polyurethane/acid-treated multi walled **carbon nanotube** composite)
IT **Polymer** morphology
(micromorphol.; waterborne polyurethane/acid-treated multi walled **carbon nanotube** composite)
IT Polyurethanes, preparation
RL: POF (Polymer in formulation); PRP (Properties); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
(polyester-polyether-polyurea-, block; waterborne polyurethane/acid-treated multi walled **carbon nanotube** composite)
IT Glass transition temperature
(soft and hard segments; waterborne polyurethane/acid-treated multi walled **carbon nanotube** composite)
IT **Polymer** morphology
(surface; waterborne polyurethane/acid-treated multi walled **carbon nanotube** composite)
IT Complex modulus
(tan δ; waterborne polyurethane/acid-treated multi walled **carbon nanotube** composite)
IT Coating materials
(water-thinned; waterborne polyurethane/acid-treated multi walled **carbon nanotube** composite)
IT Electric conductivity
Elongation at break
Hardness (mechanical)
Loss modulus
Nanocomposites
Particle size
Plastic films
Storage modulus
Stress-strain relationship
Tensile strength
Young's modulus
(waterborne polyurethane/acid-treated multi walled **carbon nanotube** composite)
IT **7440-44-0, Carbon**, uses
RL: MOA (Modifier or additive use); USES (Uses)
(**nanotubes**; waterborne polyurethane/acid-treated multi walled **carbon nanotube** composite)
IT 77-58-7, Dibutyl tin dilaurate
RL: CAT (Catalyst use); USES (Uses)
(**polymerization** catalyst; waterborne polyurethane/acid-treated multi walled **carbon nanotube** composite)
IT 7664-39-3, Hydrofluoric acid, uses **7697-37-2, Nitric acid**, uses
RL: NUU (Other use, unclassified); USES (Uses)
(waterborne polyurethane/acid-treated multi walled **carbon nanotube** composite)
IT 189750-64-9P, Dimethylol propionic acid-ethylene diamine-isophorone diisocyanate-PTMG block **copolymer triethylamine** salt
RL: POF (Polymer in formulation); PRP (Properties); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
(waterborne polyurethane/acid-treated multi walled **carbon nanotube** composite)
REFERENCE COUNT: 35 THERE ARE 35 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L58 ANSWER 9 OF 25 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2005:902510 HCAPLUS
DOCUMENT NUMBER: 143:220694
TITLE: Antenna using **carbon nanotubes** for microwave and its manufacture
INVENTOR(S): Morikawa, Takash; Watanabe, Hiroyuki
PATENT ASSIGNEE(S): Fuji Xerox Co., Ltd., Japan
SOURCE: Jpn. Kokai Tokkyo Koho, 48 pp.
CODEN: JKXXAF
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

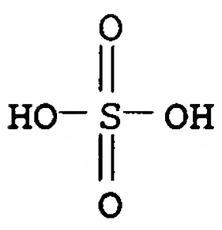
PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2005229534	A	20050825	JP 2004-38734	20040216
US 2005179594	A1	20050818	US 2004-931237	20040901
US 7116273	B2	20061003		

PRIORITY APPLN. INFO.: JP 2004-38734 A 20040216

AB The antenna has a support, a radiation unit containing a **carbon nanotube** network structure in which plural **carbon nanotubes** are mutually and electronically connected, and a current-feeding electrode connected to the radiation unit. The antenna is manufactured by forming the radiation unit by the following steps: feeding functional group-containing **carbon nanotubes** on the support and crosslinking the functional groups. The antenna is small-sized and suitable for UWB (ultra wide band).

IT **7664-93-9**, **Sulfuric acid**, uses
RL: CAT (Catalyst use); USES (Uses)
(dehydration condensation of groups with; antenna for microwave and its manufacture by crosslinking functional groups of **carbon nanotubes**)

RN 7664-93-9 HCAPLUS
CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)

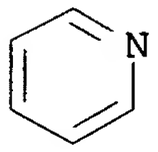


IT **7440-44-0DP**, Carbon, carboxy-containing, Me ester
RL: DEV (Device component use); IMF (Industrial manufacture); PREP (Preparation); USES (Uses)
(**nanotubes**, glycerin-crosslinked; antenna for microwave and its manufacture by crosslinking functional groups of **carbon nanotubes**)

RN 7440-44-0 HCAPLUS
CN Carbon (CA INDEX NAME)

C

IT **110-86-1, Pyridine**, uses
RL: CAT (Catalyst use); USES (Uses)
(substitution reaction of groups with; antenna for microwave and its manufacture by crosslinking functional groups of **carbon nanotubes**)
RN 110-86-1 HCAPLUS
CN Pyridine (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)



IC ICM H01Q013-08
ICS C07C069-753; H01Q001-38
CC 76-14 (Electric Phenomena)
ST microwave antenna crosslinked **carbon nanotube** radiation unit
IT Functional groups
(alkoxycarbonyl groups, of **carbon nanotube**; antenna for microwave and its manufacture by crosslinking functional groups of **carbon nanotubes**)
IT Crosslinking
(antenna for microwave and its manufacture by crosslinking functional groups of **carbon nanotubes**)
IT Microwave devices
(antennas; antenna for microwave and its manufacture by crosslinking functional groups of **carbon nanotubes**)
IT **Nanotubes**
(**carbon**; antenna for microwave and its manufacture by crosslinking functional groups of **carbon nanotubes**)
IT Polycarbodiimides
RL: DEV (Device component use); RCT (Reactant); RACT (Reactant or reagent); USES (Uses)
(crosslinker; antenna for microwave and its manufacture by crosslinking functional groups of **carbon nanotubes**)
IT Dehydration reaction
Oxidation
Substitution reaction
(functional group crosslinked by; antenna for microwave and its manufacture by crosslinking functional groups of **carbon nanotubes**)
IT Functional groups
(isocyanato group, of **carbon nanotube**; antenna for microwave and its manufacture by crosslinking functional groups of **carbon nanotubes**)
IT Antennas
(microwave; antenna for microwave and its manufacture by crosslinking functional groups of **carbon nanotubes**)

IT Amino group
Carboxyl group
Formyl group
Hydroxyl group
Sulfhydryl group
(of **carbon nanotube**; antenna for microwave and its manufacture by crosslinking functional groups of **carbon nanotubes**)

IT Halogens
RL: RCT (Reactant); RACT (Reactant or reagent)
(of **carbon nanotube**; antenna for microwave and its manufacture by crosslinking functional groups of **carbon nanotubes**)

IT Amines, uses
RL: DEV (Device component use); RCT (Reactant); RACT (Reactant or reagent); USES (Uses)
(polyamines, nonpolymeric, crosslinker; antenna for microwave and its manufacture by crosslinking functional groups of **carbon nanotubes**)

IT Carboxylic acids, uses
RL: DEV (Device component use); RCT (Reactant); RACT (Reactant or reagent); USES (Uses)
(polycarboxylic acid esters, crosslinker; antenna for microwave and its manufacture by crosslinking functional groups of **carbon nanotubes**)

IT Halides
RL: DEV (Device component use); RCT (Reactant); RACT (Reactant or reagent); USES (Uses)
(polycarboxylic acid, crosslinker; antenna for microwave and its manufacture by crosslinking functional groups of **carbon nanotubes**)

IT Carboxylic acids, uses
RL: DEV (Device component use); RCT (Reactant); RACT (Reactant or reagent); USES (Uses)
(polycarboxylic, crosslinker; antenna for microwave and its manufacture by crosslinking functional groups of **carbon nanotubes**)

IT Alcohols, uses
RL: DEV (Device component use); RCT (Reactant); RACT (Reactant or reagent); USES (Uses)
(polyhydric, crosslinker; antenna for microwave and its manufacture by crosslinking functional groups of **carbon nanotubes**)

IT 56-81-5, Glycerin, uses 75-13-8D, Isocyanic acid, esters, **polymers** 107-21-1, Ethylene glycol, uses 123-31-9, Hydroquinone, uses 11069-51-5, Hexynediol 12542-32-4, Butenediol 28346-70-5, Naphthalenediol
RL: DEV (Device component use); RCT (Reactant); RACT (Reactant or reagent); USES (Uses)
(crosslinker; antenna for microwave and its manufacture by crosslinking functional groups of **carbon nanotubes**)

IT 538-75-0, Dicyclohexylcarbodiimide 1892-57-5, N-Ethyl-N'-(3-dimethylaminopropyl)carbodiimide **7664-93-9**, **Sulfuric acid**, uses
RL: CAT (Catalyst use); USES (Uses)
(dehydration condensation of groups with; antenna for microwave and its manufacture by crosslinking functional groups of **carbon nanotubes**)

IT **7440-44-0DP**, Carbon, carboxy-containing, Me ester

RL: DEV (Device component use); IMF (Industrial manufacture); PREP (Preparation); USES (Uses)
(**nanotubes**, glycerin-crosslinked; antenna for microwave and its manufacture by crosslinking functional groups of **carbon nanotubes**)

IT 7553-56-2, Iodine, uses
RL: CAT (Catalyst use); USES (Uses)
(oxidation of groups with; antenna for microwave and its manufacture by crosslinking functional groups of **carbon nanotubes**)

IT **110-86-1**, **Pyridine**, uses 141-52-6, Sodium ethoxide 1310-58-3, Potassium hydroxide, uses 1310-73-2, Sodium hydroxide, uses
RL: CAT (Catalyst use); USES (Uses)
(substitution reaction of groups with; antenna for microwave and its manufacture by crosslinking functional groups of **carbon nanotubes**)

L58 ANSWER 10 OF 25 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2005:656699 HCAPLUS
DOCUMENT NUMBER: 144:293425
TITLE: **Functionalization** and **dispersion** in a polymer-matrix of single-wall **carbon nanotubes** : a FT-IR study
AUTHOR(S): Curulli, A.; Valentini, F.; Orlanducci, S.; Tamburri, E.; Terranova, M. L.; Cesaro, S. Nunziante; Palleschi, G.
CORPORATE SOURCE: ISMN CNR Division, Rome, 00161, Italy
SOURCE: IEEE-NANO 2004, Fourth IEEE Conference on Nanotechnology, Muenchen, Germany, Aug. 16-19, 2004 (2004), 492-494. Institute of Electrical and Electronics Engineers: New York, N. Y.
CODEN: 69HAVP; ISBN: 0-7803-8537-3
DOCUMENT TYPE: Conference; General Review; (computer optical disk)
LANGUAGE: English

AB A review. The exceptional structural, mech., chemical and electronic properties of Single-Wall **Carbon Nanotubes** (SWCNTs) make them suitable for the development of a completely new class of sensors and actuators, biosensors, electrochem. capacitors and supercapacitors. As a result, the study of CNT-based nanostructured and **functional** materials has become an interesting theme. In particular, the formation of CNT/polymer composites, besides possible improvements in the mech. and elec. properties of polymers, is considered a promising approach for the assembling of hybrid CNTs-polymer devices. However, manipulation and processing of SWCNTs is generally limited by their insoly. in most common **solvents**. Considerable effort has therefore been devoted to the chemical **modification** and derivation of **carbon nanotubes**. In this work we described different treatments of **carbon nanotube** materials and a FT-IR study to demonstrate the **functionalization** of SWCNTs.

CC 37-0 (Plastics Manufacture and Processing)

ST review single wall **carbon nanotube** polymer composite **dispersion functionalization**

IT IR spectroscopy
(Fourier-transform; **functionalization** and **dispersion** of single-wall **carbon**

nanotubes in polymer matrix)
IT **Nanotubes**
(**carbon**; **functionalization** and **dispersion** of single-wall **carbon nanotubes** in polymer matrix)
IT Cyclic voltammetry
Dispersion (of materials)
(**functionalization** and **dispersion** of single-wall **carbon nanotubes** in polymer matrix)
IT Polymers, properties
RL: POF (Polymer in formulation); PRP (Properties); USES (Uses)
(**functionalization** and **dispersion** of single-wall **carbon nanotubes** in polymer matrix)
REFERENCE COUNT: 9 THERE ARE 9 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L58 ANSWER 11 OF 25 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2005:622821 HCAPLUS
DOCUMENT NUMBER: 144:233862
TITLE: Covalent **functionalization** of multiwalled **carbon nanotubes** by polyvinylimidazole
AUTHOR(S): Yang, Zhenglong; Pu, Hongting; Yin, Junlin
CORPORATE SOURCE: Institute of Functional Polymer, School of Materials Science and Engineering, Tongji University, Shanghai, 200092, Peop. Rep. China
SOURCE: Materials Letters (2005), 59(22), 2838-2841
CODEN: MLETDJ; ISSN: 0167-577X
PUBLISHER: Elsevier B.V.
DOCUMENT TYPE: Journal
LANGUAGE: English
AB The multiwalled **C nanotubes** (MWCNT), silane **functionalized**, and covalently bonded by polyvinylimidazole (PVI) (MWCNT-b-PVI) were synthesized and both their chemical and aggregated structures were characterized by TEM, IR, XRD and SEM measurements. MWCNT-b-PVI showed enhanced chemical stability in many common **solvents** and enhanced thermal stability. It will supply a new way to synthesize **functional** materials with new optical, magnetic and elec. properties, combining excellent mechanics, heat-stabilization, optical, elec., processing and film forming properties of **C nanotubes** and heterocyclic polymer.
IT **7440-44-0DP**, Carbon, reaction products with polyvinylimidazole
RL: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation)
(**nanotubes**; polyvinylimidazole bound multiwalled **carbon nanotubes**)
RN 7440-44-0 HCAPLUS
CN Carbon (CA INDEX NAME)

C

CC 37-5 (Plastics Manufacture and Processing)
Section cross-reference(s): 49

ST **carbon nanotube** acryloylsilane **modification emulsion** polymn vinylimidazole

IT **Nanotubes**
(**carbon**, reaction products with polyvinylimidazole; polyvinylimidazole bound multiwalled **carbon nanotubes**)

IT Polymer morphology
(of polyvinylimidazole bound multiwalled **carbon nanotubes**)

IT 25232-42-2DP, Poly n-vinylimidazole, reaction products with **carbon nanotubes**
RL: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation)
(bound multiwalled **carbon nanotubes**)

IT 2530-85-0, KH-570
RL: RCT (Reactant); RACT (Reactant or reagent)
(coupling agent; polyvinylimidazole bound multiwalled **carbon nanotubes**)

IT **7440-44-0DP**, Carbon, reaction products with polyvinylimidazole
RL: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation)
(**nanotubes**; polyvinylimidazole bound multiwalled **carbon nanotubes**)

REFERENCE COUNT: 10 THERE ARE 10 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L58 ANSWER 12 OF 25 HCAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 2005:561537 HCAPLUS
DOCUMENT NUMBER: 143:134403
TITLE: Preparation method of **carbon nanotube** ion exchange **resin** with improved mechanical strength and thermal stability
INVENTOR(S): Xu, Xuecheng
PATENT ASSIGNEE(S): East China Normal University, Peop. Rep. China
SOURCE: Faming Zhuanli Shenqing Gongkai Shuomingshu, No pp. given
CODEN: CNXXEV
DOCUMENT TYPE: Patent
LANGUAGE: Chinese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
CN 1546555	A	20041117	CN 2003-10109478	20031217

PRIORITY APPLN. INFO.: CN 2003-10109478 20031217

AB The method includes (a) treating styrene and divinylbenzene with 2 N NaOH or an ion exchange **resin** to remove **polymerization** inhibitor, (b) **polymerizing** styrene, divinylbenzene, and benzoyl peroxide at 60° for 1.5 h, adding **carbon nanotube**, and **polymerizing** for 0.5 h, (c) preparing an aqueous

phase containing gelatin, water, and polyacrylamide, (d) adding the monomer mixture from (b) to the aqueous phase and **polymerizing** 5-6 h at 78-80°, 5-6 h at 85-86°, and 5-6 h at 95-96°, (e) washing and drying, (f) **sulfonating** for an acidic cation exchange **resin**, or (g) chloromethylating and quaternizing with **trimethylamine** for a basic anion exchange **resin.**

IT **7440-44-0, Carbon**, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(**nanotubes**; preparation method of **carbon nanotube** ion exchange **resin** with improved mech. strength and thermal stability)

RN 7440-44-0 HCAPLUS
CN Carbon (CA INDEX NAME)

C

IC ICM C08J005-20
ICS C08K003-04
CC 38-3 (Plastics Fabrication and Uses)
Section cross-reference(s): 37
ST **carbon nanotube** ion exchange **resin** in situ **polymn**; styrene divinylbenzene **copolymer** **carbon nanotube** ion exchanger
IT **Nanotubes**
(**carbon**; preparation method of **carbon nanotube** ion exchange **resin** with improved mech. strength and thermal stability)
IT Anion exchangers
Cation exchangers
(preparation method of **carbon nanotube** ion exchange **resin** with improved mech. strength and thermal stability)
IT **7440-44-0, Carbon**, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(**nanotubes**; preparation method of **carbon nanotube** ion exchange **resin** with improved mech. strength and thermal stability)
IT 9003-70-7DP, Styrene-divinylbenzene **copolymer**, chloromethylated and quaternized with **trimethylamine**
9003-70-7DP, Styrene-divinylbenzene **copolymer**, sulfonated
RL: IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(preparation method of **carbon nanotube** ion exchange **resin** with improved mech. strength and thermal stability)

L58 ANSWER 13 OF 25 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2005:472069 HCAPLUS
DOCUMENT NUMBER: 142:465854
TITLE: Thermal treatment of **functionalized carbon nanotubes** in solution to effect their defunctionalization
INVENTOR(S): Tour, James M.; Dyke, Christopher A.
PATENT ASSIGNEE(S): William Marsh Rice University, USA
SOURCE: PCT Int. Appl., 22 pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent

LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2005049488	A2	20050602	WO 2004-US35894	200410 28
WO 2005049488	A3	20050728		

W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW

RW: BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG

PRIORITY APPLN. INFO.: US 2003-516392P P 200310 31

AB **Functionalized** (derivatized) **carbon nanotubes** (CNTs) are thermally defunctionalized in solution or **suspended** in a liquid medium. Such defunctionalization largely comprises the removal of sidewall **functionality** from the CNTs, but can also serve to remove **functionality** from the CNT ends. Such methods facilitate the resuspension of such defunctionalized CNTs in various **solvents** and permit the defunctionalization of **functionalized** CNTs that would normally decompose (or partially decompose) upon thermal treatment. The **solvent** is thermally stable at temps. required for defunctionalization, such as o-dichlorobenzene, benzene, toluene, water, sulfuric acid, oleum, sulfuric acid with dissolved potassium persulfate,liquid ammonia, liquid ammonia with dissolved alkali metals, alkanes, paraffins, thiophene, or their mixts.

IT **7440-44-0**, **Carbon**, processes
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)
(**nanotubes**, defunctionalization; thermal treatment of **functionalized carbon nanotubes** in solution to effect their defunctionalization)

RN 7440-44-0 HCAPLUS
CN Carbon (CA INDEX NAME)

C

IC ICM C01B031-00
CC 49-1 (Industrial Inorganic Chemicals)
ST thermal treatment **functionalized carbon nanotube** defunctionalization **solvent**
IT **Nanotubes**
(**carbon**; thermal treatment of **functionalized**

carbon nanotubes in solution to effect their defunctionalization)

IT Heat treatment
(thermal treatment of **functionalized carbon nanotubes** in solution to effect their defunctionalization)

IT 106-47-8, 4-Chloroaniline, processes 769-92-6, 4-tert-Butylaniline
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)
(**carbon nanotubes modified** with; thermal treatment of **functionalized carbon nanotubes** in solution to effect their defunctionalization)

IT **7440-44-0, Carbon**, processes
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)
(**nanotubes**, defunctionalization; thermal treatment of **functionalized carbon nanotubes** in solution to effect their defunctionalization)

IT 95-50-1, o-Dichlorobenzene
RL: NUU (Other use, unclassified); USES (Uses)
(**solvent**; thermal treatment of **functionalized carbon nanotubes** in solution to effect their defunctionalization)

L58 ANSWER 14 OF 25 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2005:402636 HCAPLUS
DOCUMENT NUMBER: 142:450596
TITLE: Composite and method of manufacturing the same
INVENTOR(S): Anazawa, Kazunori; Manabe, Chikara; Hirakata, Masaki; Kishi, Kentaro; Shigematsu, Taishi; Watanabe, Miho; Isozaki, Takashi; Watanabe, Hiroyuki; Ooma, Shigeki; Okada, Shinsuke
PATENT ASSIGNEE(S): Fuji Xerox Co., Ltd., Japan
SOURCE: Eur. Pat. Appl., 32 pp.
CODEN: EPXXDW
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 3
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
EP 1529858	A1	20050511	EP 2004-19497	200408 17
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR, BG, CZ, EE, HU, PL, SK, HR				
JP 2005154887	A	20050616	JP 2004-141086	200405 11

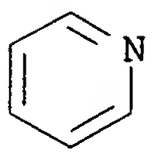
PRIORITY APPLN. INFO.: JP 2003-367402 A 200310 28
JP 2004-141086 A 200405 11

AB An easily prepared metal composite with **carbon**

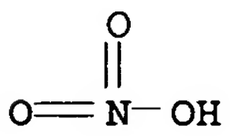
nanotubes is claimed. Provided are: a composite formed by mixing a **C nanotube** structure and a metal-containing material, the **C nanotube** structure having a network structure constructed by mutually crosslinking functional groups bonded to plural **C nanotubes** through chemical bonding of the functional groups together; and a method of manufacturing the same. The composite of the **C nanotube** and the metal-containing material is capable of effectively using characteristics of the **C nanotube** structure.

IT **110-86-1**, **Pyridine**, processes **7697-37-2**, **Nitric acid**, processes
RL: CPS (Chemical process); NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(composite and manufacturing method using functionalized **carbon nanotubes**)

RN 110-86-1 HCAPLUS
CN Pyridine (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)



RN 7697-37-2 HCAPLUS
CN Nitric acid (8CI, 9CI) (CA INDEX NAME)



IT **7440-44-0**, **Carbon**, processes
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PYP (Physical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(**nanotubes**; composite and manufacturing method using functionalized **carbon nanotubes**)

RN 7440-44-0 HCAPLUS
CN Carbon (CA INDEX NAME)

C

IC ICM D01F009-127
ICS D01F011-12; C22C047-00
CC 57-8 (Ceramics)
Section cross-reference(s): 48, 66
ST **carbon nanotube** metal compd composite functional group crosslinking
IT **Nanotubes**
(**carbon**; composite and manufacturing method using functionalized **carbon nanotubes**)
IT Addition reaction
Bond formation
Catalysts

Ceramic composites
Cermets
Condensation reaction
Crosslinking
Crosslinking agents
Dehydration reaction
Esterification
Functional groups
Mixing
Oxidation
Solvents
Substitution reaction
(composite and manufacturing method using functionalized **carbon nanotubes**)

IT Polycarbodiimides
Thiols, processes
RL: CPS (Chemical process); NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(composite and manufacturing method using functionalized **carbon nanotubes**)

IT Metals, processes
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PYP (Physical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(composite and manufacturing method using functionalized **carbon nanotubes**)

IT Carboxylic acids, preparation
RL: SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(functional group; composite and manufacturing method using functionalized **carbon nanotubes**)

IT Amines, processes
RL: CPS (Chemical process); NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(polyamines, nonpolymeric; composite and manufacturing method using functionalized **carbon nanotubes**)

IT Carboxylic acids, processes
RL: CPS (Chemical process); NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(polycarboxylic, halides; composite and manufacturing method using functionalized **carbon nanotubes**)

IT Carboxylic acids, processes
RL: CPS (Chemical process); NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(polycarboxylic; composite and manufacturing method using functionalized **carbon nanotubes**)

IT Alcohols, processes
RL: CPS (Chemical process); NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(polyhydric; composite and manufacturing method using functionalized **carbon nanotubes**)

IT 7553-56-2, Iodine, uses
RL: CAT (Catalyst use); USES (Uses)
(composite and manufacturing method using functionalized **carbon nanotubes**)

IT 56-81-5, Glycerin, processes 67-56-1, Methanol, processes 75-13-8D, Isocyanic acid, esters, **polymers** 107-21-1, Ethylene glycol, processes **110-86-1**, **Pyridine**, processes 123-31-9, Hydroquinone, processes 141-52-6, Sodium ethoxide 919-30-2, Aminopropyltriethoxysilane 1310-58-3, Potassium hydroxide, processes 1310-73-2, Sodium hydroxide, processes 7440-21-3, Silicon, processes 7440-74-6, Indium, processes **7697-37-2**, **Nitric acid**, processes 7784-30-7, Aluminum phosphate 11069-51-5, Hexynediol 25265-75-2, Butanediol 28346-70-5, Naphthalenediol
RL: CPS (Chemical process); NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(composite and manufacturing method using functionalized **carbon nanotubes**)

IT 7429-90-5D, Aluminum, compds. 7429-91-6D, Dysprosium, compds. 7439-89-6D, Iron, compds. 7439-91-0D, Lanthanum, compds. 7439-92-1D, Lead, compds. 7439-93-2D, Lithium, compds. 7439-95-4D, Magnesium, compds. 7439-96-5D, Manganese, compds. 7439-97-6D, Mercury, compds. 7440-00-8D, Neodymium, compds. 7440-02-0D, Nickel, compds. 7440-09-7D, Potassium, compds. 7440-10-0D, Praseodymium, compds. 7440-17-7D, Rubidium, compds. 7440-19-9D, Samarium, compds. 7440-22-4D, Silver, compds. 7440-31-5D, Tin, compds. 7440-39-3D, Barium, compds. 7440-41-7D, Beryllium, compds. 7440-42-8D, Boron, compds. 7440-43-9D, Cadmium, compds. 7440-45-1D, Cerium, compds. 7440-47-3D, Chromium, compds. 7440-48-4D, Cobalt, compds. 7440-50-8D, Copper, compds. 7440-58-6D, Hafnium, compds. 7440-65-5D, Yttrium, compds. 7440-66-6D, Zinc, compds. 7440-69-9D, Bismuth, compds. 7440-70-2D, Calcium, compds.
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PYP (Physical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(composite and manufacturing method using functionalized **carbon nanotubes**)

IT **7440-44-0**, **Carbon**, processes
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PYP (Physical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(**nanotubes**; composite and manufacturing method using functionalized **carbon nanotubes**)

REFERENCE COUNT: 3 THERE ARE 3 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L58 ANSWER 15 OF 25 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2005:322701 HCAPLUS
DOCUMENT NUMBER: 142:377911
TITLE: **Carbon nanotube**-ceramic composites and their manufacture
INVENTOR(S): Anazawa, Kazunori; Manabe, Isamu; Hirakata, Masaki; Kishi, Kentaro; Shigematsu, Hiroshi; Watanabe, Miho; Watanabe, Hiroyuki; Isozaki, Takashi; Oma, Shigeki; Okada, Shinsuke
PATENT ASSIGNEE(S): Fuji Xerox Co., Ltd., Japan
SOURCE: Jpn. Kokai Tokkyo Koho, 30 pp.
CODEN: JKXXAF
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1

PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2005097046	A	20050414	JP 2003-333777	200309 25
PRIORITY APPLN. INFO.:			JP 2003-333777	200309 25

AB The composites are manufactured by supplying solns. containing functional group-bonded **carbon nanotubes** to substrate surfaces, chemical linking the functional groups to form network structures of crosslinked **carbon nanotubes**, and forming composites of the **carbon nanotube** structures with ceramics. The composites have high mech. strength, thermal conductivity, and elec. conductivity

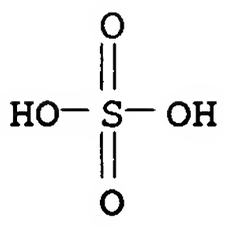
IT **7440-44-0**, Carbon, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(ceramic containing; network-structure **carbon nanotube**-ceramic composites and their manufacture by crosslinking functional groups on **nanotubes** before forming composites)

RN 7440-44-0 HCAPLUS
CN Carbon (CA INDEX NAME)

C

IT **7664-93-9**, **Sulfuric acid**, uses
RL: NUU (Other use, unclassified); USES (Uses)
(condensation agent; network-structure **carbon nanotube**-ceramic composites and their manufacture by crosslinking functional groups on **nanotubes** before forming composites)

RN 7664-93-9 HCAPLUS
CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)

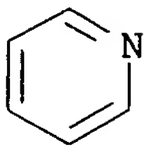


IT **7440-44-0DP**, **Carbon**, carboxylated, Me ester
RL: IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(**nanotube**, multiwall, glycerin-crosslinked; network-structure **carbon nanotube**-ceramic composites and their manufacture by crosslinking functional groups on **nanotubes** before forming composites)

RN 7440-44-0 HCAPLUS
CN Carbon (CA INDEX NAME)

C

IT **110-86-1**, **Pyridine**, uses
RL: NUU (Other use, unclassified); USES (Uses)
(substitution reaction with; network-structure **carbon nanotube**-ceramic composites and their manufacture by crosslinking functional groups on **nanotubes** before forming composites)
RN 110-86-1 HCAPLUS
CN Pyridine (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)



IC ICM C04B035-52
ICS B82B001-00; C01B031-02; C04B035-83
CC 57-2 (Ceramics)
ST **carbon nanotube** crosslinked network structure ceramic composite
IT Functional groups
(alkoxycarbonyl groups, on **carbon nanotubes**; network-structure **carbon nanotube**-ceramic composites and their manufacture by crosslinking functional groups on **nanotubes** before forming composites)
IT **Nanotubes**
(**carbon**; network-structure **carbon nanotube**-ceramic composites and their manufacture by crosslinking functional groups on **nanotubes** before forming composites)
IT Carbides
Nitrides
Oxides (inorganic), uses
Silicides
RL: TEM (Technical or engineered material use); USES (Uses)
(ceramic containing; network-structure **carbon nanotube**-ceramic composites and their manufacture by crosslinking functional groups on **nanotubes** before forming composites)
IT Polycarbodiimides
RL: RCT (Reactant); RACT (Reactant or reagent)
(crosslinker; network-structure **carbon nanotube** -ceramic composites and their manufacture by crosslinking functional groups on **nanotubes** before forming composites)
IT Addition reaction
Dehydration reaction
Oxidation
Substitution reaction
(crosslinking by; network-structure **carbon nanotube**-ceramic composites and their manufacture by crosslinking functional groups on **nanotubes** before forming composites)
IT Functional groups
(haloformyl, on **carbon nanotubes**; network-structure **carbon nanotube**-ceramic composites and their manufacture by crosslinking functional groups on

nanotubes before forming composites)
IT Functional groups
(isocyanato group, on **carbon nanotubes**; network-structure **carbon nanotube**-ceramic composites and their manufacture by crosslinking functional groups on **nanotubes** before forming composites)
IT Ceramic composites
(network-structure **carbon nanotube**-ceramic composites and their manufacture by crosslinking functional groups on **nanotubes** before forming composites)
IT Amines, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(polyamines, nonpolymeric, crosslinker; network-structure **carbon nanotube**-ceramic composites and their manufacture by crosslinking functional groups on **nanotubes** before forming composites)
IT Carboxylic acids, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(polycarboxylic acid esters, crosslinker; network-structure **carbon nanotube**-ceramic composites and their manufacture by crosslinking functional groups on **nanotubes** before forming composites)
IT Halides
RL: RCT (Reactant); RACT (Reactant or reagent)
(polycarboxylic acid, crosslinker; network-structure **carbon nanotube**-ceramic composites and their manufacture by crosslinking functional groups on **nanotubes** before forming composites)
IT Carboxylic acids, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(polycarboxylic, crosslinker; network-structure **carbon nanotube**-ceramic composites and their manufacture by crosslinking functional groups on **nanotubes** before forming composites)
IT Carboxylic acids, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(polycarboxylic, salts, halides, crosslinker; network-structure **carbon nanotube**-ceramic composites and their manufacture by crosslinking functional groups on **nanotubes** before forming composites)
IT Alcohols, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(polyhydric, crosslinker; network-structure **carbon nanotube**-ceramic composites and their manufacture by crosslinking functional groups on **nanotubes** before forming composites)
IT Carboxyl group
(surface, esterified, on **carbon nanotubes**; network-structure **carbon nanotube**-ceramic composites and their manufacture by crosslinking functional groups on **nanotubes** before forming composites)
IT Amino group
Hydroxyl group
(surface, on **carbon nanotubes**; network-structure **carbon nanotube**-ceramic composites and their manufacture by crosslinking functional groups on **nanotubes** before forming composites)
IT Crosslinking
(surface; network-structure **carbon nanotube**-ceramic composites and their manufacture by crosslinking functional

groups on **nanotubes** before forming composites)

IT 7631-86-9, Si 05S, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(Si 05S, ceramic; network-structure **carbon nanotube**-ceramic composites and their manufacture by crosslinking functional groups on **nanotubes** before forming composites)

IT 7429-90-5, Aluminum, uses 7439-91-0, Lanthanum, uses 7439-92-1, Lead, uses 7439-95-4, Magnesium, uses 7440-09-7, Potassium, uses 7440-21-3, Silicon, uses 7440-24-6, Strontium, uses 7440-32-6, Titanium, uses 7440-42-8, Boron, uses **7440-44-0**, Carbon, uses 7440-45-1, Cerium, uses 7440-58-6, Hafnium, uses 7440-65-5, Yttrium, uses 7440-67-7, Zirconium, uses 7440-69-9, Bismuth, uses 7440-70-2, Calcium, uses 7727-37-9, Nitrogen, uses 7782-41-4, Fluorine, uses 7782-44-7, Oxygen, uses 7782-50-5, Chlorine, uses 24389-64-8, Boride
RL: TEM (Technical or engineered material use); USES (Uses)
(ceramic containing; network-structure **carbon nanotube**-ceramic composites and their manufacture by crosslinking functional groups on **nanotubes** before forming composites)

IT 538-75-0, Dicyclohexylcarbodiimide 1892-57-5, N-Ethyl-N'-(3-dimethylaminopropyl)carbodiimide **7664-93-9**, **Sulfuric acid**, uses
RL: NUU (Other use, unclassified); USES (Uses)
(condensation agent; network-structure **carbon nanotube**-ceramic composites and their manufacture by crosslinking functional groups on **nanotubes** before forming composites)

IT 56-81-5, Glycerin, reactions 75-13-8D, Isocyanic acid, esters, **polymers** 107-21-1, Ethylene glycol, reactions 123-31-9, Hydroquinone, reactions 11069-51-5, Hexynediol 12542-32-4, Butenediol 28346-70-5, Naphthalenediol
RL: RCT (Reactant); RACT (Reactant or reagent)
(crosslinker; network-structure **carbon nanotube**-ceramic composites and their manufacture by crosslinking functional groups on **nanotubes** before forming composites)

IT **7440-44-0DP**, **Carbon**, carboxylated, Me ester
RL: IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(**nanotube**, multiwall, glycerin-crosslinked; network-structure **carbon nanotube**-ceramic composites and their manufacture by crosslinking functional groups on **nanotubes** before forming composites)

IT 7553-56-2, Iodine, uses
RL: NUU (Other use, unclassified); USES (Uses)
(oxidation accelerator; network-structure **carbon nanotube**-ceramic composites and their manufacture by crosslinking functional groups on **nanotubes** before forming composites)

IT **110-86-1**, **Pyridine**, uses 141-52-6, Sodium ethoxide 1310-58-3, Potassium hydroxide, uses 1310-73-2, Sodium hydroxide, uses
RL: NUU (Other use, unclassified); USES (Uses)
(substitution reaction with; network-structure **carbon nanotube**-ceramic composites and their manufacture by crosslinking functional groups on **nanotubes** before forming composites)

L58 ANSWER 16 OF 25 HCAPLUS COPYRIGHT 2007 ACS on STN

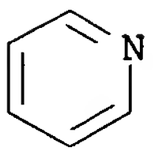
ACCESSION NUMBER: 2005:315627 HCAPLUS
DOCUMENT NUMBER: 142:356397
TITLE: **Carbon nanotube**-reinforced **polymeric** composite and method of manufacturing the same
INVENTOR(S): Watanabe, Miho; Kishi, Kentaro; Manabe, Chikara; Anazawa, Kazunori; Hirakata, Masaki; Shigematsu, Taishi; Watanabe, Hiroyuki; Isozaki, Takashi; Ooma, Shigeki; Okada, Shinsuke
PATENT ASSIGNEE(S): Fuji Xerox Co., Ltd., Japan
SOURCE: Eur. Pat. Appl., 29 pp.
CODEN: EPXXDW
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
EP 1522552	A1	20050413	EP 2004-21371	20040908
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR, BG, CZ, EE, HU, PL, SK, HR				
JP 2005133062	A	20050526	JP 2004-178468	20040616
US 2005170169	A1	20050804	US 2004-935244	20040908

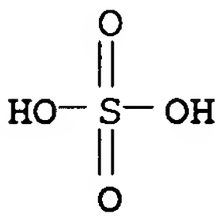
PRIORITY APPLN. INFO.: JP 2003-350826 A 20031009
JP 2004-178468 A 20040616

AB Provided is a **nanotube-polymer** composite which can effectively utilize characteristics of a **carbon nanotube** structure. The composite includes a **carbon nanotube** structure and a **polymer** (e.g., Rikacoat PN 20), in which: the **carbon nanotube** structure has a network structure constructed by mutually crosslinking functional groups bonded to multiple **carbon nanotubes** through chemical bonding of the functional groups together; and the **polymer** is filled in the network structure. Also provided is a method of manufacturing a composite which includes the steps of: supplying a base body surface with a solution containing multiple **carbon nanotubes** to which multiple functional groups are bonded; mutually crosslinking the multiple **carbon nanotubes** through chemical bonding of the multiple functional groups together to construct a network structure constituting a **carbon nanotube** structure; impregnating the network structure with a **polymer** liquid forming a **polymer**; and combining the **carbon nanotube** structure and the **polymer** by curing the **polymer** liquid

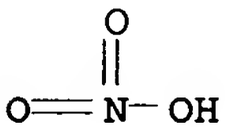
IT **110-86-1**, **Pyridine**, uses
RL: NUU (Other use, unclassified); USES (Uses)
(base; manufacture of **carbon nanotube**-reinforced **polymeric** composite)
RN 110-86-1 HCAPLUS
CN Pyridine (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)



IT **7664-93-9**, **Sulfuric acid**, reactions
RL: RGT (Reagent); RACT (Reactant or reagent)
(condensation agent; manufacture of **carbon nanotube** -reinforced **polymeric** composite)
RN 7664-93-9 HCAPLUS
CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



IT **7697-37-2**, **Nitric acid**, reactions
RL: RGT (Reagent); RACT (Reactant or reagent)
(manufacture of **carbon nanotube**-reinforced **polymeric** composite)
RN 7697-37-2 HCAPLUS
CN Nitric acid (8CI, 9CI) (CA INDEX NAME)



IT **7440-44-0DP**, Carbon, Me carboxylate-derivs., reaction products with glycerin
RL: IMF (Industrial manufacture); MOA (Modifier or additive use); PREP (Preparation); USES (Uses)
(**nanotubes**, network structure; manufacture of **carbon nanotube**-reinforced **polymeric** composite)
RN 7440-44-0 HCAPLUS
CN Carbon (CA INDEX NAME)

C

IC ICM C08K009-04
ICS C08K009-08
CC 38-3 (Plastics Fabrication and Uses)
ST **carbon nanotube** crosslinking network structure **polymer** composite

IT Reinforced plastics
RL: TEM (Technical or engineered material use); USES (Uses)
(carbon fiber-reinforced; manufacture of **carbon nanotube**-reinforced **polymeric** composite)

IT **Nanotubes**
(**carbon**; manufacture of **carbon nanotube** -reinforced **polymeric** composite)

IT Crosslinking agents
Oxidation catalysts
(manufacture of **carbon nanotube**-reinforced **polymeric** composite)

IT Epoxy **resins**, uses
Polyamides, uses
Polyimides, uses
RL: POF (Polymer in formulation); TEM (Technical or engineered material use); USES (Uses)
(manufacture of **carbon nanotube**-reinforced **polymeric** composite)

IT **110-86-1**, **Pyridine**, uses 141-52-6, Sodium ethoxide 1310-58-3, Potassium hydroxide, uses 1310-73-2, Sodium hydroxide, uses
RL: NUU (Other use, unclassified); USES (Uses)
(base; manufacture of **carbon nanotube**-reinforced **polymeric** composite)

IT 538-75-0, Dicy-clohexyl carbodiimide 1892-57-5, N-Ethyl-N'-(3-dimethylaminopropyl)carbodiimide **7664-93-9**, **Sulfuric acid**, reactions
RL: RGT (Reagent); RACT (Reactant or reagent)
(condensation agent; manufacture of **carbon nanotube** -reinforced **polymeric** composite)

IT 56-81-5, Glycerin, uses 107-21-1, Ethylene glycol, uses 123-31-9, Hydroquinone, uses 11069-51-5, Hexynediol 12542-32-4, Butenediol 28346-70-5, Naphthalenediol
RL: MOA (Modifier or additive use); USES (Uses)
(crosslinking agent; manufacture of **carbon nanotube** -reinforced **polymeric** composite)

IT 67-56-1, Methanol, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(esterification agent; manufacture of **carbon nanotube**-reinforced **polymeric** composite)

IT 9002-86-2, Polyvinyl chloride 9002-88-4, Polyethylene 9003-07-0, Polypropylene 251902-33-7, Rikacoat PN 20
RL: POF (Polymer in formulation); TEM (Technical or engineered material use); USES (Uses)
(manufacture of **carbon nanotube**-reinforced **polymeric** composite)

IT **7697-37-2**, **Nitric acid**, reactions
RL: RGT (Reagent); RACT (Reactant or reagent)
(manufacture of **carbon nanotube**-reinforced **polymeric** composite)

IT **7440-44-0DP**, Carbon, Me carboxylate-derivs., reaction products with glycerin
RL: IMF (Industrial manufacture); MOA (Modifier or additive use); PREP (Preparation); USES (Uses)
(**nanotubes**, network structure; manufacture of **carbon nanotube**-reinforced **polymeric** composite)

IT 56-81-5D, Glycerin, reaction products with Me carboxylated **carbon nanotube**
RL: MOA (Modifier or additive use); USES (Uses)
(network structure; manufacture of **carbon nanotube**

-reinforced **polymeric** composite)
IT 7553-56-2, Iodine, uses
RL: CAT (Catalyst use); USES (Uses)
(oxidative reaction accelerator; manufacture of **carbon nanotube**-reinforced **polymeric** composite)
REFERENCE COUNT: 10 THERE ARE 10 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L58 ANSWER 17 OF 25 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2005:200958 HCAPLUS
DOCUMENT NUMBER: 143:212696
TITLE: Styrenic **nanocomposite** containing well-**dispersed carbon nanotubes**
AUTHOR(S): Tsiang, Raymond C.; Liu, I-Chun
CORPORATE SOURCE: Department of Chemical Engineering, National Chung Cheng University, Chiayi, 621, Taiwan
SOURCE: Polymer Preprints (American Chemical Society, Division of Polymer Chemistry) (2005), 46(1), 229-230
CODEN: ACPPAY; ISSN: 0032-3934
PUBLISHER: American Chemical Society, Division of Polymer Chemistry
DOCUMENT TYPE: Journal; (computer optical disk)
LANGUAGE: English
AB Upon a ligand exchange reaction of ferrocene, the multiwalled **carbon nanotubes** (MWNTs) were **modified.** The **modified** MWNTs next underwent a direct monolithiation with tert-butyllithium and were terminated with p-chloromethylstyrene. This p-chloromethylstyrene-terminated species were then **functionalized** with living polystyryllithiums. The final products-the polystyrene-anchored MWNTs were soluble in common organic **solvents** and showed distinct color and absorption spectra. The SEM and TEM images showed that the MWNTs were well-**dispersed** and had polystyrene attached to the surface.
CC 38-3 (Plastics Fabrication and Uses)
ST polystyrene anchored ferrocene **modified** multiwalled **carbon nanotube nanocomposite**
IT **Nanotubes**
(**carbon**; preparation and characterization of polystyrene-anchored ferrocene-**modified** multiwalled **carbon nanotube nanocomposites**)
IT Exchange reaction
(coordinative; preparation and characterization of polystyrene-anchored ferrocene-**modified** multiwalled **carbon nanotube nanocomposites**)
IT Nanocomposites
Polymer morphology
(preparation and characterization of polystyrene-anchored ferrocene-**modified** multiwalled **carbon nanotube nanocomposites**)
IT 102-54-5DP, Ferrocene, monolithiated, reaction products with p-chloromethylstyrene, polymers 29296-32-0DP, p-Chloromethylstyrene homopolymer, reaction products with ferrocene-**modified** multiwalled **carbon nanotubes**
RL: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation)
(preparation and characterization of polystyrene-anchored ferrocene-

modified multiwalled **carbon nanotube** **nanocomposites**)

REFERENCE COUNT: 13 THERE ARE 13 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L58 ANSWER 18 OF 25 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2005:160514 HCAPLUS
DOCUMENT NUMBER: 142:250664
TITLE: Resistance element, method of manufacturing the same, and thermistor
INVENTOR(S): Watanabe, Miho; Hirakata, Masaki; Anazawa, Kazunori; Manabe, Chikara; Kishi, Kentaro; Shigematsu, Taishi; Isozaki, Takashi; Watanabe, Hiroyuki; Ooma, Shigeki; Okada, Shinsuke
PATENT ASSIGNEE(S): Fuji Xerox Co., Ltd., Japan
SOURCE: U.S. Pat. Appl. Publ., 38 pp.
CODEN: USXXCO
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

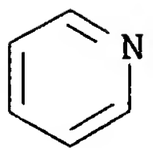
PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 2005040371	A1	20050224	US 2004-765927	20040129
JP 2005072209	A	20050317	JP 2003-299230	20030822

PRIORITY APPLN. INFO.: JP 2003-299230 A 20030822

AB To provide a resistance element having an elec. resistance body with excellent stability and a method of manufacturing the same. The resistance element includes an elec. resistance body, on a base body surface, consisting of a **C nanotube** structure layer, which configures a mesh structure in which at least plural **C nanotubes** are cross-linked to one another. The method of manufacturing the resistance element includes: an applying step of applying the base body surface with a liquid solution containing **C nanotubes** having functional groups; and a crosslinking step of forming the **C nanotube** structure layer, used as an elec. resistance body, that configures a mesh structure in which the plural **C nanotubes** are cross-linked to one another through curing of the liquid solution after application.

IT **110-86-1**, **Pyridine**, processes
RL: CPS (Chemical process); NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(crosslinking agent; resistance element, method of manufacturing same using crosslinked functionalized **carbon nanotubes**, and thermistor)

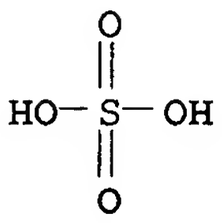
RN 110-86-1 HCAPLUS
CN Pyridine (6CI, 7CI, 8CI, 9CI) (CA INDEX NAME)



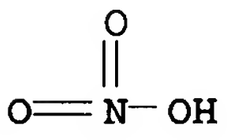
IT **7440-44-0**, **Carbon**, processes
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PYP (Physical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(**nanotubes**; resistance element, method of manufacturing same using crosslinked functionalized **carbon nanotubes**, and thermistor)
RN 7440-44-0 HCAPLUS
CN Carbon (CA INDEX NAME)

C

IT **7664-93-9**, **Sulfuric acid**, processes
7697-37-2, **Nitric acid**, processes
RL: CPS (Chemical process); NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(surface treatment agent; resistance element, method of manufacturing same using crosslinked functionalized **carbon nanotubes**, and thermistor)
RN 7664-93-9 HCAPLUS
CN Sulfuric acid (8CI, 9CI) (CA INDEX NAME)



RN 7697-37-2 HCAPLUS
CN Nitric acid (8CI, 9CI) (CA INDEX NAME)



IC ICM H01B001-00
INCL 252500000
CC 76-2 (Electric Phenomena)
Section cross-reference(s): 38, 48
ST resistor fabrication thermistor **carbon nanotube** coating
IT Coating process
(**carbon nanotube** solution; resistance element, method of manufacturing same using crosslinked functionalized **carbon nanotubes**, and thermistor)
IT Functional groups
(**carbon nanotube**; resistance element, method

of manufacturing same using crosslinked functionalized **carbon nanotubes**, and thermistor)

IT **Nanotubes**
(**carbon**; resistance element, method of manufacturing same using crosslinked functionalized **carbon nanotubes**, and thermistor)

IT Substitution reaction
(crosslinking agent; resistance element, method of manufacturing same using crosslinked functionalized **carbon nanotubes**, and thermistor)

IT Anhydrides
Bases, processes
Carboxylic acids, processes
Polycarbodiimides
RL: CPS (Chemical process); NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(crosslinking agent; resistance element, method of manufacturing same using crosslinked functionalized **carbon nanotubes**, and thermistor)

IT Amines, processes
RL: CPS (Chemical process); NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(polyamines, nonpolymeric, crosslinking agent; resistance element, method of manufacturing same using crosslinked functionalized **carbon nanotubes**, and thermistor)

IT Carboxylic acids, processes
RL: CPS (Chemical process); NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(polycarboxylic acid esters, crosslinking agent; resistance element, method of manufacturing same using crosslinked functionalized **carbon nanotubes**, and thermistor)

IT Carboxylic acids, processes
RL: CPS (Chemical process); NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(polycarboxylic, crosslinking agent; resistance element, method of manufacturing same using crosslinked functionalized **carbon nanotubes**, and thermistor)

IT Carboxylic acids, processes
RL: CPS (Chemical process); NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(polycarboxylic, halides, crosslinking agent; resistance element, method of manufacturing same using crosslinked functionalized **carbon nanotubes**, and thermistor)

IT Carboxylic acids, processes
RL: CPS (Chemical process); NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(polycarboxylic, salts, crosslinking agent; resistance element, method of manufacturing same using crosslinked functionalized **carbon nanotubes**, and thermistor)

IT Alcohols, processes
RL: CPS (Chemical process); NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(polyhydric, crosslinking agent; resistance element, method of

manufacturing same using crosslinked functionalized **carbon nanotubes**, and thermistor)

IT Crosslinking agents
Polymerization
Resistors
Thermistors
(resistance element, method of manufacturing same using crosslinked functionalized **carbon nanotubes**, and thermistor)

IT Esterification
(surface treatment agent; resistance element, method of manufacturing same using crosslinked functionalized **carbon nanotubes**, and thermistor)

IT 56-81-5, Glycerin, processes 75-13-8D, Isocyanic acid, esters, **polymers** 83-56-7, 1,5-Naphthalenediol **110-86-1**, **Pyridine**, processes 123-31-9, 1,4-Benzenediol, processes 141-52-6, Sodium ethoxide 142-30-3, 2,5-Dimethyl-3-hexyne-2,5-diol 573-58-0, Congo Red 1310-58-3, Potassium hydroxide, processes 1310-73-2, Sodium hydroxide, processes 15663-27-1, Cisplatin 25952-53-8, N-Ethyl-N'-(3-dimethylaminopropyl)carbodiimide hydrochloride
RL: CPS (Chemical process); NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(crosslinking agent; resistance element, method of manufacturing same using crosslinked functionalized **carbon nanotubes**, and thermistor)

IT 110-64-5P, 2-Butene-1,4-diol
RL: CPS (Chemical process); NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); SPN (Synthetic preparation); PREP (Preparation); PROC (Process); USES (Uses)
(crosslinking agent; resistance element, method of manufacturing same using crosslinked functionalized **carbon nanotubes**, and thermistor)

IT **7440-44-0**, **Carbon**, processes
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PYP (Physical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(**nanotubes**; resistance element, method of manufacturing same using crosslinked functionalized **carbon nanotubes**, and thermistor)

IT 6974-12-5, 1,4-Dibromo-2-butene
RL: CPS (Chemical process); NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(precursor; resistance element, method of manufacturing same using crosslinked functionalized **carbon nanotubes**, and thermistor)

IT 18621-75-5P, 1,4-Diacetoxy-2-butene
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); SPN (Synthetic preparation); PREP (Preparation); PROC (Process)
(precursor; resistance element, method of manufacturing same using crosslinked functionalized **carbon nanotubes**, and thermistor)

IT 67-56-1, Methanol, uses 68-12-2, Dimethylformamide, uses
RL: NUU (Other use, unclassified); USES (Uses)
(solvent; resistance element, method of manufacturing same using crosslinked functionalized **carbon nanotubes**, and thermistor)

IT **7664-93-9, Sulfuric acid**, processes
7697-37-2, Nitric acid, processes
RL: CPS (Chemical process); NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(surface treatment agent; resistance element, method of manufacturing same using crosslinked functionalized **carbon nanotubes**, and thermistor)

L58 ANSWER 19 OF 25 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2005:97737 HCAPLUS
DOCUMENT NUMBER: 143:389312
TITLE: Solubilization and **functionalization** of **carbon nanotubes**
AUTHOR(S): Jin, Wei-jun; Sun, Xu-feng; Wang, Yu
CORPORATE SOURCE: School of Chemistry and Chemical Engineering, Shanxi University, Taiyuan, 030006, Peop. Rep. China
SOURCE: Xinxing Tan Cailiao (2004), 19(4), 312-318
CODEN: XTCAFT; ISSN: 1007-8827
PUBLISHER: Kexue Chubanshe
DOCUMENT TYPE: Journal; General Review
LANGUAGE: Chinese
AB This review describes the methods for improving the solubility of **carbon nanotubes** in water or organic **solvents** by (a) noncovalent interaction, i.e., straight **dispersion** in a single **solvent**, charge transfer between electron donor and acceptor, the wrapping effect of soluble polymers or cylindrical micelles, and (b) by the covalent chemical **modification** of the **carbon nanotubes**, i.e., end-opening, chemical derivatization, and side-wall chemical **modification.** The focus of **carbon nanotube** science in future years should be (a) on improving the properties of **carbon nanotubes** by noncovalent or covalent chemical **modification**, (b) on extending the application fields of **carbon nanotubes** by coupling chemical, biol., and phys. **function** to **carbon nanotubes**, and (c) on a deeper understanding of the reaction theory of **carbon nanotubes** in solution
IT **7440-44-0, Carbon**, processes
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process)
(**nanotubes**; overview on solubilization and **functionalization** of **carbon nanotubes**)
RN 7440-44-0 HCAPLUS
CN Carbon (CA INDEX NAME)

C

CC 49-0 (Industrial Inorganic Chemicals)
ST review **carbon nanotube** solubilization **functionalization**
IT **Nanotubes**
(**carbon**; overview on solubilization and **functionalization** of **carbon nanotubes**)

IT **7440-44-0**, **Carbon**, processes
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process)
(**nanotubes**; overview on solubilization and **functionalization** of **carbon nanotubes**
)

L58 ANSWER 20 OF 25 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2004:755065 HCAPLUS
DOCUMENT NUMBER: 142:198827
TITLE: Chemical **modification** of **carbon nanotubes** and preparation of polystyrene/**carbon nanotubes** composites
AUTHOR(S): Ham, Hyeong Taek; Koo, Chong Min; Kim, Sang Ouk; Choi, Yeong Suk; Chung, In Jae
CORPORATE SOURCE: Department of Chemical and Biomolecular Engineering, KAIST (Korea Advanced Institute of Science and Technology), Daejeon, 3731, S. Korea
SOURCE: Macromolecular Research (2004), 12(4), 384-390
CODEN: MRAECT; ISSN: 1598-5032
PUBLISHER: Polymer Society of Korea
DOCUMENT TYPE: Journal
LANGUAGE: English
AB Single-walled **carbon nanotubes** (SWNTs) have been chemical **modified** through the formation of carboxylic acid **functionalities** or by grafting octadecylamine and polystyrene onto them. The authors purified SWNTs with nitric acid to remove some remaining catalysts and amorphous carbon materials. After purification, the authors broke the **carbon nanotubes** and shortened their lengths by using a 3:1 mixture of concentrated sulfuric acid and nitric acid. During these purification and cutting processes, carboxylic acid units formed at the open ends of the SWNTs. Octadecylamine and amino-terminated polystyrene were grafted onto the cut SWNTs by condensation reactions between the amine and carboxylic acid units. The cut SWNTs did not **disperse** in organic **solvents**, but the octadecylamine-grafted and polystyrene-grafted SWNTs **dispersed** well in dichloromethane and aromatic **solvents** (e.g., benzene, toluene). Composites were prepared by mixing polystyrene with the octadecylamine-grafted or polystyrene-grafted SWNTs. Each composite had a higher dynamic storage modulus than that of a pristine polystyrene. The composites exhibited enhanced storage moduli, complex viscosities, and unusual non-terminal behavior when compared with a monodisperse polystyrene matrix because of the good **dispersion** of **carbon nanotubes** in the polystyrene matrix.
IT **7440-44-0**, **Carbon**, uses
RL: MOA (Modifier or additive use); RCT (Reactant); RACT (Reactant or reagent); USES (Uses)
(**nanotubes**; chemical **modification** of **carbon nanotubes** and preparation of polystyrene/**carbon nanotubes** composites)
RN 7440-44-0 HCAPLUS
CN Carbon (CA INDEX NAME)

C

CC 37-5 (Plastics Manufacture and Processing)
Section cross-reference(s): 49
ST polystyrene composite carboxylated **carbon nanotube** dynamic mech property
IT **Nanotubes**
(**carbon**; chemical **modification** of **carbon** **nanotubes** and preparation of polystyrene/**carbon** **nanotubes** composites)
IT Loss modulus
Mechanical loss
Storage modulus
X-ray photoelectron spectra
(chemical **modification** of **carbon** **nanotubes** and preparation of polystyrene/**carbon** **nanotubes** composites)
IT Viscosity
(complex; chemical **modification** of **carbon** **nanotubes** and preparation of polystyrene/**carbon** **nanotubes** composites)
IT 9003-53-6, Polystyrene
RL: POF (Polymer in formulation); PRP (Properties); USES (Uses)
(chemical **modification** of **carbon** **nanotubes** and preparation of polystyrene/**carbon** **nanotubes** composites)
IT 9003-53-6DP, Polystyrene, amino-terminated, reaction products with **modified carbon nanotubes**
RL: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation)
(chemical **modification** of **carbon** **nanotubes** and preparation of polystyrene/**carbon** **nanotubes** composites)
IT 124-30-1, Octadecylamine 7664-93-9, Sulfuric acid, reactions 7697-37-2, Nitric acid, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(chemical **modification** of **carbon** **nanotubes** and preparation of polystyrene/**carbon** **nanotubes** composites)
IT **7440-44-0**, **Carbon**, uses
RL: MOA (Modifier or additive use); RCT (Reactant); RACT (Reactant or reagent); USES (Uses)
(**nanotubes**; chemical **modification** of **carbon nanotubes** and preparation of polystyrene/**carbon nanotubes** composites)
REFERENCE COUNT: 23 THERE ARE 23 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L58 ANSWER 21 OF 25 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2004:469061 HCAPLUS
DOCUMENT NUMBER: 141:161118
TITLE: **Functionalization** of multi-walled **carbon nanotubes** by electrografting of polyacrylonitrile
AUTHOR(S): Petrov, Petar; Lou, Xudong; Pagnoulle, Christophe; Jerome, Christine; Calberg, Cedric; Jerome, Robert
CORPORATE SOURCE: Center for Education and Research on Macromolecules (CERM), University of Liege, Liege, 4000, Belg.
SOURCE: Macromolecular Rapid Communications (2004),

25(10), 987-990
CODEN: MRCOE3; ISSN: 1022-1336
PUBLISHER: Wiley-VCH Verlag GmbH & Co. KGaA
DOCUMENT TYPE: Journal
LANGUAGE: English

AB Multi-walled **carbon nanotubes** (MWNTs) have been successfully **modified** with polyacrylonitrile (PAN) by a cathodic electrochem. process. The surface-**modified** MWNTs afforded are then **dispersible** in good **solvents** for PAN, such as N,N-dimethylformamide (DMF). Collected from a dilute **dispersion**, these MWNTs are essentially disentangled, as confirmed by transmission electron microscopy (TEM) anal. From the differential scanning calorimetry (DSC) traces for polyacrylonitrile and polyacrylonitrile-grafted MWNTs, the maximum grafting ratio is estimated at 0.28.

IT **7440-44-0**, **Carbon**, processes
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process)
(**nanotubes**, multi-walled, polyacrylonitrile-**modified**; **functionalization** of multi-walled **carbon nanotubes** by electrografting of polyacrylonitrile)

RN 7440-44-0 HCAPLUS
CN Carbon (CA INDEX NAME)

C

CC 57-8 (Ceramics)
Section cross-reference(s): 38, 66

ST **carbon nanotube** polyacrylonitrile **modification** electrografting

IT **Nanotubes**
(**carbon**, multi-walled, polyacrylonitrile-**modified**; **functionalization** of multi-walled **carbon nanotubes** by electrografting of polyacrylonitrile)

IT Electrodeposition
(electrografting; **functionalization** of multi-walled **carbon nanotubes** by electrografting of polyacrylonitrile)

IT **Functional** groups
(polyacrylonitrile; **functionalization** of multi-walled **carbon nanotubes** by electrografting of polyacrylonitrile)

IT 68-12-2, Formamide, N,N-dimethyl-, uses
RL: NUU (Other use, unclassified); USES (Uses)
(**dispersing solvent**; **functionalization** of multi-walled **carbon nanotubes** by electrografting of polyacrylonitrile)

IT **7440-44-0**, **Carbon**, processes
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process)
(**nanotubes**, multi-walled, polyacrylonitrile-**modified**; **functionalization** of multi-walled **carbon nanotubes** by electrografting of polyacrylonitrile)

IT 25014-41-9, Polyacrylonitrile
RL: MOA (Modifier or additive use); USES (Uses)

(surface **modifier**; **functionalization** of multi-walled **carbon nanotubes** by electrografting of polyacrylonitrile)

REFERENCE COUNT: 15 THERE ARE 15 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L58 ANSWER 22 OF 25 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2004:427695 HCAPLUS
DOCUMENT NUMBER: 140:431399
TITLE: Method of forming patterned film of surface-**modified carbon nanotubes** via negative-working photolithography process
INVENTOR(S): Park, Jong Jin; Lee, Jae Jun; Jung, Myung Sup
PATENT ASSIGNEE(S): Samsung Electronics Co., Ltd., S. Korea
SOURCE: Eur. Pat. Appl., 12 pp.
CODEN: EPXXDW
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
EP 1422563	A1	20040526	EP 2003-256824	20031028
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR, BG, CZ, EE, HU, SK				
KR 2004043638	A	20040524	KR 2002-72017	20021119
JP 2004167677	A	20040617	JP 2003-375753	20031105
CN 1502555	A	20040609	CN 2003-10118169	20031106
US 2004101634	A1	20040527	US 2003-713254	20031117
US 7008758	B2	20060307		

PRIORITY APPLN. INFO.: KR 2002-72017 A 20021119

AB Disclosed herein is a method of forming a neg. pattern of **carbon nanotubes** through: **modifying** the surfaces of **carbon nanotubes** to have double bond-containing **functional** group capable of participating in radical polymerization; coating process a substrate with a liquid coating process composition prepared by **dispersing** the surface-**modified carbon nanotubes** in an organic **solvent** along with a photoinitiator; exposing the film to UV light through a photomask to induce radical polymerization of the **carbon nanotubes**; and developing the film. By virtue of the present invention, desired patterns of **carbon**

nanotubes can be easily made on the surfaces of various substrates according to the conventional photolithog. procedure.

IT **7440-44-0**, **Carbon**, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(**nanotubes**, acryloyl; method of forming patterned film of surface-**modified carbon nanotubes** via neg.-working photolithog. process)
RN 7440-44-0 HCAPLUS
CN Carbon (CA INDEX NAME)

C

IT **7440-44-0D**, **Carbon**, acryloylated
RL: TEM (Technical or engineered material use); USES (Uses)
(**nanotubes**; method of forming patterned film of surface-**modified carbon nanotubes** via neg.-working photolithog. process)
RN 7440-44-0 HCAPLUS
CN Carbon (CA INDEX NAME)

C

IC ICM G03F007-027
CC 74-5 (Radiation Chemistry, Photochemistry, and Photographic and Other Reprographic Processes)
ST patterned film surface **carbon nanotube** photolithog
IT **Nanotubes**
(**carbon**, acryloyl; method of forming patterned film of surface-**modified carbon nanotubes** via neg.-working photolithog. process)
IT **Nanotubes**
(**carbon**, carboxylated; method of forming patterned film of surface-**modified carbon nanotubes** via neg.-working photolithog. process)
IT **Nanotubes**
(**carbon**, vinylbenzylated; method of forming patterned film of surface-**modified carbon nanotubes** via neg.-working photolithog. process)
IT **Nanotubes**
(**carbon**; method of forming patterned film of surface-**modified carbon nanotubes** via neg.-working photolithog. process)
IT Photolithography
(method of forming patterned film of surface-**modified carbon nanotubes** via neg.-working photolithog. process)
IT **7440-44-0**, **Carbon**, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(**nanotubes**, acryloyl; method of forming patterned film of surface-**modified carbon nanotubes** via neg.-working photolithog. process)
IT **7440-44-0D**, **Carbon**, acryloylated
7440-44-0D, **Carbon**, carboxylated
7440-44-0D, **Carbon**, vinylbenzylated
RL: TEM (Technical or engineered material use); USES (Uses)

(**nanotubes**; method of forming patterned film of surface-**modified carbon nanotubes** via neg.-working photolithog. process)
REFERENCE COUNT: 3 THERE ARE 3 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L58 ANSWER 23 OF 25 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2003:1011653 HCAPLUS
DOCUMENT NUMBER: 140:181907
TITLE: Preparing a Styrenic Polymer Composite Containing Well-**Dispersed** **Carbon Nanotubes**: Anionic Polymerization of a Nanotube-Bound p-Methylstyrene
AUTHOR(S): Liu, I-Chun; Huang, Hsuan-Ming; Chang, Ching-Yu; Tsai, Hung-Chieh; Hsu, Chuan-Hsiao; Tsiang, Raymond Chien-Chao
CORPORATE SOURCE: Department of Chemical Engineering, National Chung Cheng University, Chïayi, Taiwan
SOURCE: Macromolecules (2004), 37(2), 283-287
CODEN: MAMOBX; ISSN: 0024-9297
PUBLISHER: American Chemical Society
DOCUMENT TYPE: Journal
LANGUAGE: English
AB Multiple-walled **carbon nanotubes** (MWNTs) were chemical **modified** by a ligand-exchange reaction of ferrocene (Cp-Fe-Cp). The **modified** MWNTs (Cp-Fe-MWNTs) were next monolithiated by tert-butyllithium and terminated by p-chloromethylstyrene (pMS). The pMS-terminated species (pMS-Cp-Fe-MWNTs) were then **functionalized** with living polystyryllithium anions via anionic polymerization The resulting polystyrene-**functionalized** MWNTs exhibited as polymeric nanocomposites and were soluble in common organic **solvents** showing distinct colors from a neat polystyrene solution Syntheses results and the characterization data of the **functionalized** MWNTs, collected from GC-MS, NMR, electron microscopy, and optical spectroscopy, are presented and discussed.
CC 35-4 (Chemistry of Synthetic High Polymers)
Section cross-reference(s): 29, 57
ST ferrocene **modified carbon nanotube** polystyrene **nanocomposite** prepn characterization
IT Polymerization
(anionic, living; in preparation of a styrenic polymer composite containing well-**dispersed carbon nanotubes**)
IT **Nanotubes**
(**carbon**; preparing a styrenic polymer composite containing well-**dispersed carbon nanotubes** using a **nanotube**-bound p-methylstyrene)
IT Polymer morphology
Thermal stability
(of a styrenic polymer composite containing well-**dispersed carbon nanotubes**)
IT Nanocomposites
(preparing a styrenic polymer **nanocomposite** containing well-**dispersed carbon nanotubes** using a **nanotube**-bound p-methylstyrene)
IT 1592-20-7DP, p-Chloromethylstyrene, product with monolithiated ferrocene/**carbon nanotubes**

RL: PRP (Properties); RCT (Reactant); SPN (Synthetic preparation); PREP (Preparation); RACT (Reactant or reagent)
(preparing a styrenic polymer composite containing well-**dispersed carbon nanotubes** using a **nanotube**-bound p-methylstyrene)

IT 102-54-5DP, Ferrocene, product with **carbon nanotubes**, tert-butyllithium, p-chloromethylstyrene, and polystyrene lithium 594-19-4DP, tert-Butyllithium, product with ferrocene/**carbon nanotubes**, p-chloromethylstyrene, and polystyrene lithium 1592-20-7DP, p-Chloromethylstyrene, product with ferrocene/**carbon nanotubes**, tert-butyllithium, and polystyrene lithium 36345-04-7DP, Polystyrene lithium, product with ferrocene/**carbon nanotubes**, tert-butyllithium, and p-Chloromethylstyrene
RL: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation)
(preparing a styrenic polymer composite containing well-**dispersed carbon nanotubes** using a **nanotube**-bound p-methylstyrene)

REFERENCE COUNT: 26 THERE ARE 26 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

L58 ANSWER 24 OF 25 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2003:55396 HCAPLUS
DOCUMENT NUMBER: 138:296467
TITLE: Chemical **modification** of single-wall **carbon nanotubes** with octadecylamine and amino-terminated polystyrene
AUTHOR(S): Ham, Hyeong Taek; Koo, Chong Min; Kim, Sang Ouk; Choi, Yeong Suk; Chung, In Jae
CORPORATE SOURCE: Department of Chemical and Biomolecular Engineering, KAIST, Daejeon, 305-701, S. Korea
SOURCE: Hwahak Konghak (2002), 40(5), 618-623
CODEN: HHKHAT; ISSN: 0304-128X
PUBLISHER: Korean Institute of Chemical Engineers
DOCUMENT TYPE: Journal
LANGUAGE: Korean

AB The solubility enhancement of single-wall **carbon nanotubes** in various organic **solvents** was investigated by chemical **modification** of the **nanotubes**. Carboxylic acids were attached to the open ends of the **nanotubes** during purification and cutting. Octadecylamine and amino-terminated polystyrene were grafted to cut **nanotubes** via the formation of amide **functionality**. The **nanotubes** with carboxylic acid bond were not **dispersed** well in organic **solvents**. But, polystyrene-grafted and octadecylamine-grafted **nanotubes** were **dispersed** well in some organic **solvents**.

IT **7440-44-0P**, Carbon, preparation
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PUR (Purification or recovery); PREP (Preparation); PROC (Process)
(chemical **modification** of single-wall **carbon nanotubes** with octadecylamine and amino-terminated polystyrene)

RN 7440-44-0 HCAPLUS
CN Carbon (CA INDEX NAME)

C

CC 78-1 (Inorganic Chemicals and Reactions)
ST **carbon nanotube** chem **modification** octyldecylamine **modified** polystyrene
IT **Nanotubes**
(**carbon**; chemical **modification** of single-wall **carbon nanotubes** with octadecylamine and amino-terminated polystyrene)
IT 124-30-1, Octadecylamine 9003-53-6, Polystyrene
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)
(chemical **modification** of single-wall **carbon nanotubes** with octadecylamine and amino-terminated polystyrene)
IT **7440-44-0P**, Carbon, preparation
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PUR (Purification or recovery); PREP (Preparation); PROC (Process)
(chemical **modification** of single-wall **carbon nanotubes** with octadecylamine and amino-terminated polystyrene)

L58 ANSWER 25 OF 25 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2002:594777 HCAPLUS
DOCUMENT NUMBER: 137:156802
TITLE: Process for derivatizing **carbon nanotubes** with diazonium species and compositions thereof
INVENTOR(S): Tour, James M.; Bahr, Jeffrey L.; Yang, Jiping
PATENT ASSIGNEE(S): William Marsh Rice University, USA
SOURCE: PCT Int. Appl., 45 pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2002060812	A2	20020808	WO 2002-US2562	20020129
WO 2002060812	A3	20021114		
W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW				
RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW, AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG				
AU 2002240159	A1	20020812	AU 2002-240159	20020129

GB 2389847	A	20031224	GB 2003-19871	200201 29
GB 2389847	B	20050810		
DE 10295944	T0	20040415	DE 2002-10295944	200201 29
JP 2004530646	T	20041007	JP 2002-560970	200201 29
CN 1620528	A	20050525	CN 2002-805837	200201 29
GB 2411169	A	20050824	GB 2005-8698	200201 29
GB 2411169	B	20051026		
GB 2412370	A	20050928	GB 2005-13244	200201 29
GB 2412370	B	20051109		
GB 2413123	A	20051019	GB 2005-13638	200201 29
GB 2413123	B	20051207		
US 2004071624	A1	20040415	US 2003-470517	200307 29
US 2005074390	A1	20050407	US 2003-632284	200308 01
US 2005074613	A1	20050407	US 2003-632948	200308 01
US 2005207963	A1	20050922	US 2003-632419	200308 01
PRIORITY APPLN. INFO.:			US 2001-264784P	P 200101 29
			US 2001-272903P	P 200103 02
			US 2001-316501P	P 200108 31
			US 2001-316521P	P 200108 31
			GB 2003-19871	A3 200201 29
			WO 2002-US2562	W 200201 29

US 2003-470517 A3
200307
29

AB The invention incorporates new processes for the chemical **modification** of **carbon nanotubes.** Such processes involve the derivatization of multi- and single-wall **carbon nanotubes**, including small diameter (.apprx.0.7 nm) single-wall **carbon nanotubes**, with diazonium species. The method allows the chemical attachment of a variety of organic compds. to the side and ends of **carbon nanotubes.** These chemical **modified** nanotubes have applications in polymer composite materials, mol. electronic applications and sensor devices. The methods of derivatization include electrochem. induced reactions thermally induced reactions (via in-situ generation of diazonium compds. or pre-formed diazonium compds.), and photochem. induced reactions. The derivatization causes significant changes in the spectroscopic properties of the nanotubes. The estimated degree of **functionality** is .apprx.1 out of every 20 to 30 carbons in a nanotube bearing a **functionality** moiety. Such electrochem. reduction processes can be adapted to apply site-selective chemical **functionalization** of nanotubes. Moreover, when **modified** with suitable chemical groups, the derivatized nanotubes are chemical compatible with a polymer matrix, allowing transfer of the properties of the nanotubes (such as, mech. strength or elec. conductivity) to the properties of the composite material as a whole. Furthermore, when **modified** with suitable chemical groups, the groups can be polymerized to form a polymer that includes **carbon nanotubes.**

IC ICM C01B

CC 49-1 (Industrial Inorganic Chemicals)
Section cross-reference(s): 38

ST **carbon nanotube** chem **modification** composite material

IT **Nanotubes**
(**carbon**; process for derivatizing **carbon nanotubes** with diazonium species and compns. thereof)

IT Composites
(polymer; process for derivatizing **carbon nanotubes** with diazonium species and compns. thereof)

IT Molecular electronics
Sensors
Solvents
UV and visible spectra
(process for derivatizing **carbon nanotubes** with diazonium species and compns. thereof)

IT Fluoropolymers, uses
RL: DEV (Device component use); USES (Uses)
(process for derivatizing **carbon nanotubes** with diazonium species and compns. thereof)

IT 7440-22-4, Silver, uses
RL: DEV (Device component use); USES (Uses)
(**colloidal** paste; process for derivatizing **carbon nanotubes** with diazonium species and compns. thereof)

IT 39385-56-3, Poly(phenylene-1,2-ethynediyl)
RL: TEM (Technical or engineered material use); USES (Uses)
(mol. wire; process for derivatizing **carbon nanotubes** with diazonium species and compns. thereof)

IT 7440-06-4, Platinum, uses 7761-88-8, Silver nitrate (AgNO3), uses
9002-84-0, PTFE
RL: DEV (Device component use); USES (Uses)
(process for derivatizing **carbon nanotubes**
with diazonium species and compns. thereof)

IT 369-48-2P, 4-Methoxycarbonylbenzenediazonium tetrafluoroborate
456-25-7P 456-27-9P, 4-Nitrobenzenediazonium tetrafluoroborate
459-45-0P, 4-Fluorobenzenediazonium tetrafluoroborate 673-40-5P,
4-Bromobenzenediazonium tetrafluoroborate 673-41-6P,
4-Chlorobenzenediazonium tetrafluoroborate 52436-75-6P,
4-tert-Butylbenzenediazonium tetrafluoroborate 62921-74-8P,
2-[2-(2-Methoxyethoxy)ethoxy]ethyl p-toluenesulfonate
113584-24-0P, 4-Tetradecylbenzenediazonium tetrafluoroborate
445396-53-2P 445396-54-3P 445396-56-5P
RL: IMF (Industrial manufacture); PREP (Preparation)
(process for derivatizing **carbon nanotubes**
with diazonium species and compns. thereof)

IT 62-53-3D, Aniline, derivs. 95-50-1, 1,2-Dichlorobenzene
14635-75-7, Nitrosonium tetrafluoroborate 14797-65-0, Nitrite,
reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(process for derivatizing **carbon nanotubes**
with diazonium species and compns. thereof)

IT 75-05-8, Acetonitrile, reactions 75-09-2, Methylene chloride,
reactions
RL: RGT (Reagent); RACT (Reactant or reagent)
(process for derivatizing **carbon nanotubes**
with diazonium species and compns. thereof)

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